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NETWORK
EDITION

MAGAZINE

New Ways to Communicate:

22 High-Speed Modems at
19.2 Kbps and Beyond

11 Fret-Free Fax Programs
Kiss Paper Good-Bye



Network Edition: Five Help-Desk
Packages Give You Support on Demand

The Top 10 CD-ROMs

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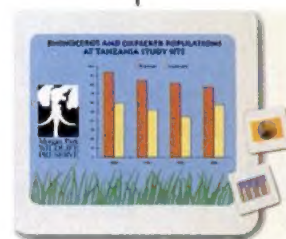
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IN THE MICROSOFT OFFICE DON'T JUST COHABIT, THEY FOR

You might say we simply borrowed the idea from nature. Programs that live in the same place should work together.

Consider what you have to do in a single week. Letters. Memos. Reports. Spreadsheets. Charts. Graphs. Presentations.

Wouldn't it be great if there



Create powerful presentations easily with information from different programs. Suddenly, you're a whiz presenter.

were a product that could help you pull it all together?

In a nutshell, that's the whole idea behind the Microsoft® Office. Now all your programs can work together like one.

Thanks to our intuitive OfficeLinks tools, it's easier than ever to share text, data and graphics seamlessly between our best-selling programs.

What's this really mean?

Simply, you'll be able to get more done. With a lot less effort.

Say you're working on your sales report. You'll probably start by writing in Microsoft Word.

*Support for Microsoft Office is no-charge; however, normal telephone company shown here, includes: Microsoft Excel, Word, the PowerPoint presentation graphics 563-9048; outside the U.S. and Canada, call your local Microsoft subsidiary or (206) logo are registered trademarks of Microsoft Corporation.

CE, SOFTWARE PROGRAMS M MEANINGFUL RELATIONSHIPS.

Then you click to open your Microsoft Access® database and call up your sales data. By client. By vendor. By salesperson. By region. By month.

But why stop there?

You can easily send that data to a Microsoft Excel spreadsheet in just a click of a button, analyze it, turn it into a dramatic chart, and drop it all back into your Word document.

It's like one big technological swap fest. The end benefit being, that now you can spend more time concentrating on your work, instead of on your software.

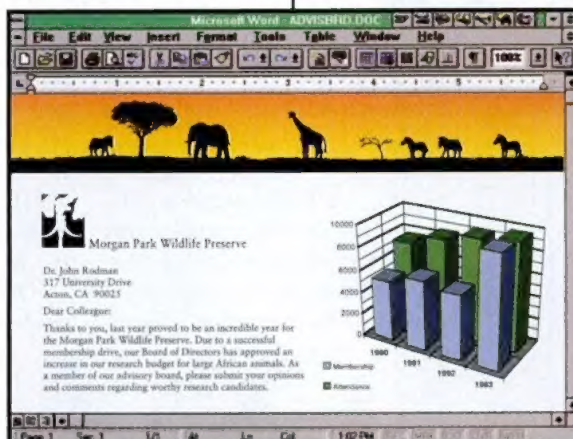
Naturally, you'll want to share your handiwork with the regional managers.

Just a couple of clicks later, you've created personalized letters for each one of them from within Microsoft Word.

Brilliant.

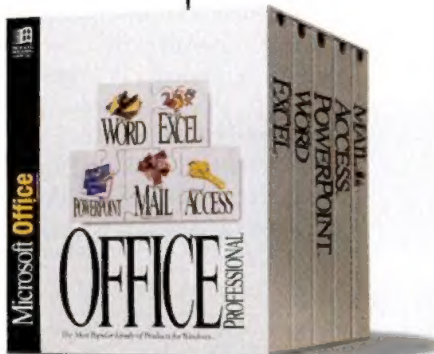
Now for the finishing touch.

Click a button and transform



It's easy to update or manage text, data and graphics in one document with the latest object linking and embedding technology (OLE 2.0). Just click where you need to work and the tools you need are right there.

everything into an eye-popping PowerPoint® presentation. Call it



a "career-enhancing" move.

And while we're on the subject of relationships, we should mention the Microsoft Office is

the only product of its kind that offers you unlimited product support with no service charge.*

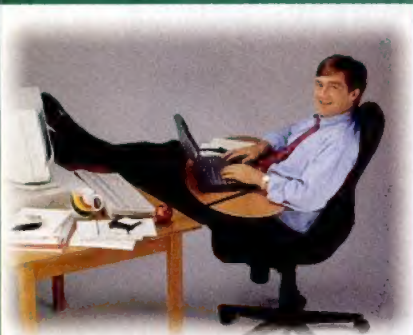
Clearly, the Microsoft Office with OfficeLinks marks a quantum shift in what software enables you to achieve. And it's a clear indication of where the future is heading.

To find out the rest of the story (a small sample of which we've covered here), visit your retailer or call (800) 894-6642, Department VAC, for your Office Information Kit.

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Microsoft Office

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Inside

Associate editor Lance Ulanoff is drowning in a sea of CDs. He and his editorial staff produced our coverage of the top 100 CD titles. Needless to say, the mission had a constantly moving target.

At *PC Magazine*, we take pride in being

comprehensive, and we were not about to let the fact that there are nearly 8,000 CD-ROM titles available today—with more being born every minute—deter us. Some of our best evaluation criteria and advice came from lengthy e-mail conversations with our far-flung editors and contributors, all of whom relished the task of plow-

ing content, user interface, and resource usage, is designed to save you from making a disappointing purchase. For instance, we found that many of the CDs can eat up 40MB of disk space and can demand a huge amount of memory—an unsettling revelation.

Our reviewers come with high credentials. Donald Trivette, our long-time games reviewer, and Gayle Ehrenman, our seen-it-all After Hours editor, tackled the huge entertainment, education, and travel categories. Rubin Rabinowitz, our academic type, looked at reference disks. Barry Simon donned his professorial garb and looked at science CDs. Jim Seymour delved into productivity apps, and Sheryl Canter revelled in



Our graphics team: Up to their ears in CDs.

developer's tools on CD. John Dvorak, curmudgeon that he is, tells us about the worst CDs ever.

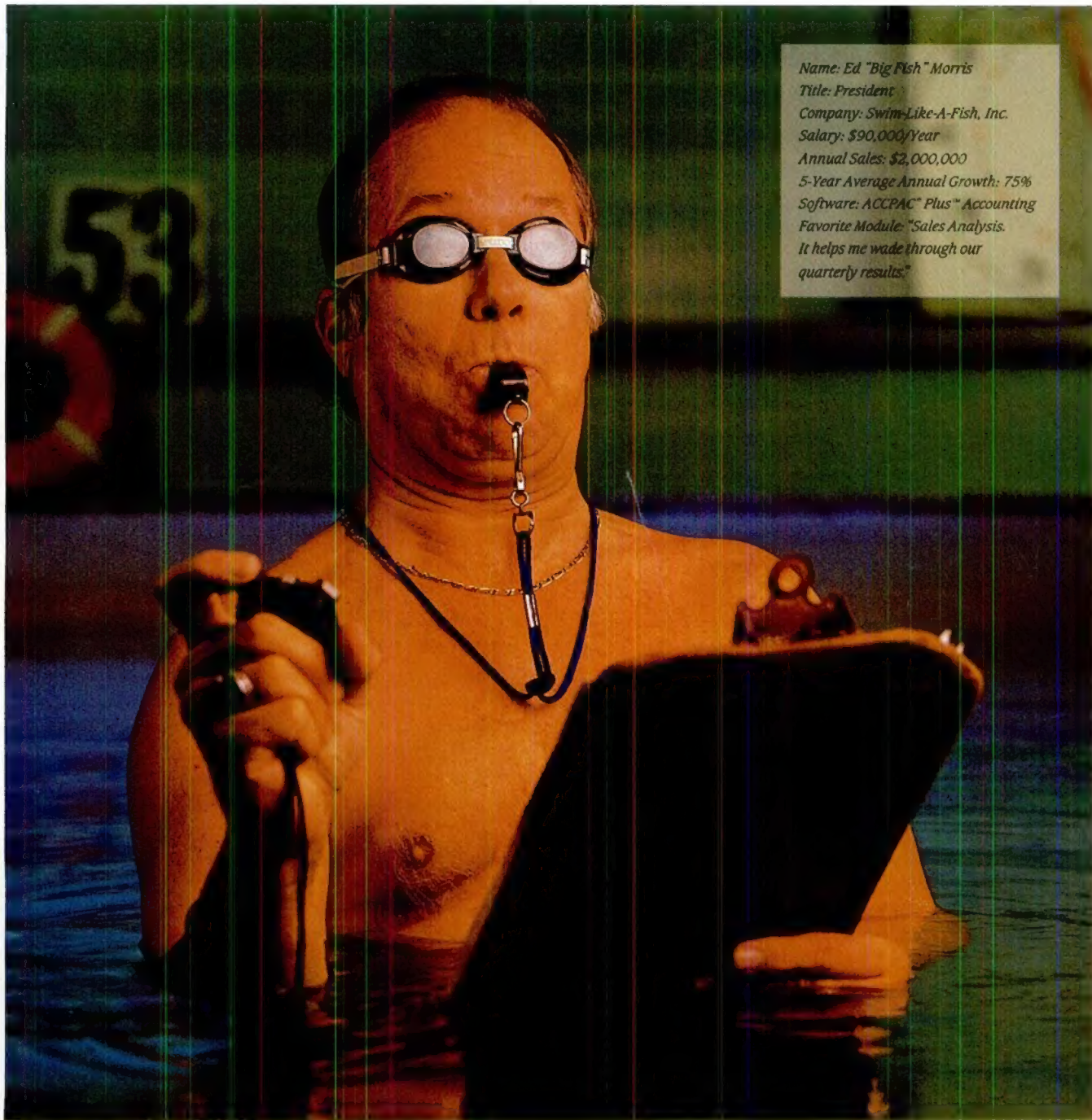
Before the ink dries on these pages, there'll be dozens of new CDs that employ new and better technologies. There'll even be a new edition of *PC Magazine's* own CD with audio-filled Screen-Demos. We'll revisit the top 100 again, but meanwhile, we're confident that the CDs reviewed in this issue will emerge as classics in their fields.—Robin Raskin

The need for such coverage is obvious. Between five and six million multimedia PCs were installed by the end of 1993. That number will double by the end of 1994. And as the demand for the medium explodes, the quality of the disks ranges from garbage to the sublime.

Our rating system, which looks

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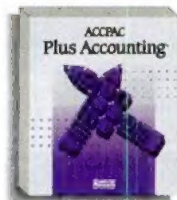
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Title: President
Company: Swim-Like-A-Fish, Inc.
Salary: \$90,000/Year
Annual Sales: \$2,000,000
5-Year Average Annual Growth: 75%
Software: ACCPAC® Plus™ Accounting
Favorite Module: "Sales Analysis."
It helps me wade through our quarterly results."

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& Financial Reporter
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Accounts Receivable
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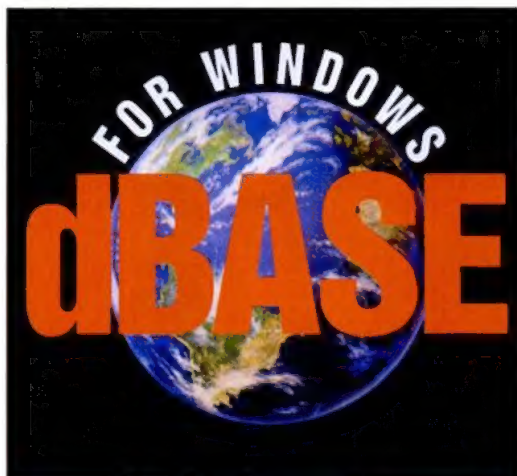
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Why dBASE is the best way to build database applications for Windows

Borland will soon release the most extended and powerful dBASE® ever produced. It will provide exciting new capabilities for managing your data, while leveraging the knowledge and skills you already have. It will set the standard for data management and applications development for years to come. This first article in a three-part series gives you an overview of dBASE for Windows.



The promise of Rapid Application Development is fulfilled

Only dBASE for Windows provides unique Two-Way-Tools™ that reduce development time by letting you work interchangeably between the visual design tool and the source code. As you design forms, queries, and menus, dBASE for Windows automatically generates object-oriented dBASE code for you. You can edit the source code directly, and your changes are reflected instantly back in your visual design.

The only compatible solution for all dBASE users

Your investment in dBASE is important. And only dBASE for Windows lets you bring all of your existing knowledge, data, and applications written in dBASE for DOS forward into Windows and client/server.

dBASE for Windows provides a single solution for your entire organization. Interactive users can get started instantly with an impressive array of intuitive data management capabilities. The new dBASE Navigator with Catalog Window lets you organize all your related files visually with simple drag-and-drop procedures. The new Visual Query Designer with SpeedFilter™ technology returns answers fast, even when you're searching multiple tables. And with the FormExpert,™ SpeedMenus,™ Interactive Tutors™ and on-line help, interactive users will be up and running and seeing productivity gains right away. Power users and developers have even more to look forward to. They get the tools and language they need to build robust Windows and client/server applications fast. And the IS organization gets a single solution that leverages their existing dBASE knowledge and resources to smooth the transition to client/server.

Full object-oriented capabilities set dBASE for Windows apart

Object-oriented programming is revolutionizing the way applications are built. The breakthrough here is how the productive, English-like language in dBASE for Windows makes it easy to learn and use object-oriented techniques to build applications fast. Built-in objects are included and ready to use. With Borland's unique Object Inspector,® you modify objects as needed with simple point-and-click commands. Of course all the objects you create are reusable, so you can put them together in new, fully functional Windows applications in record time.

Open "Plug-and-Play" architecture opens a world of opportunity

The open architecture of dBASE for Windows lets you "plug in" practically any Windows component to build solutions faster than ever before. Once any custom control (e.g., VBX, or one you've created in dBASE), .DLL, the Windows API, or SQL data source is "plugged in," it works just like everything else in dBASE. Thus, dBASE for Windows gives you incredible power and flexibility to mold the Windows environment to suit *your* design. It all means that now dBASE developers can instantly add virtually any kind of functionality to their applications—spreadsheet, communications, graphics, and more!

An easy growth path to client/server

With dBASE for Windows, you have nothing new to learn when you want to manage Oracle, Sybase, InterBase,® Informix,® or ODBC data. You use data from any of these popular database servers just like you would use a local dBASE or Paradox file. So no matter how your information needs grow, dBASE for Windows has you ready for the future.

Order dBASE for Windows today!

dBASE for Windows is a giant step forward in database power, connectivity and ease of use. It makes it remarkably easy for your entire organization to move to Windows, object-oriented computing, and client/server, while fully leveraging your existing data, applications and knowledge. dBASE for Windows, the worldwide database standard is your best path from DOS to Windows and client/server.

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COVER STORY

PC Magazine Picks...

The Top 100 CD-ROMs

BY LANCE ULANOFF CD-ROMs are everywhere. There are a myriad of titles, but how can you tell which ones are worth the plastic they're stored on? We rate the top CD-ROM titles in nine categories so you can choose from the cream of the crop.....113

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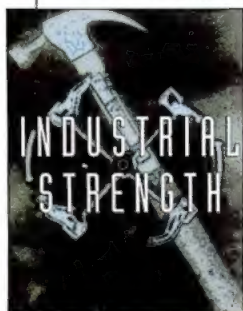
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Databases: Serious
Solutions

BY SAL RICCIARDI Building an ironclad database takes industrial-strength tools. But while today's developer databases offer new levels of power and sophistication, they're also easier to use than ever. We review ten leading database systems to show how they measure up in features, performance, and ease of use. As new Windows databases from Borland and Microsoft challenge the DOS mainstream, it may be time to reassess your tools of choice177



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Software

When Is a Fax Not a Fax?

BY M. DAVID STONE Is it still a fax when you can annotate it on your computer screen? When it's a live spreadsheet file? When you can attach it to a voice message? When you can send it out as an e-mail note? Sure. In fact, today's crop of Windows- and OS/2-based high-end fax software packages can do all that—and more. To help you choose which package is ripe for picking, we review 11 graphical fax programs that offer all the right stuff229

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Networking

High-Speed Modems:
Hurry Up and Wait

BY M. DAVID STONE In the world of modem standards, data-transmission speeds are constantly being pushed higher. You can make a career out of waiting for a new standard to be ratified and compliant modems to be out in significant numbers. In case you need more speed right now, here are 22 high-speed modems worth considering. Some are V.32terbo modems (top speed, 19.2 Kbps) and a few are proprietary models, but most are V.Fast Class modems that run at 28.8 Kbps and can be upgraded to the new V.34 standard. This way, you can have the speed now and the standard later278



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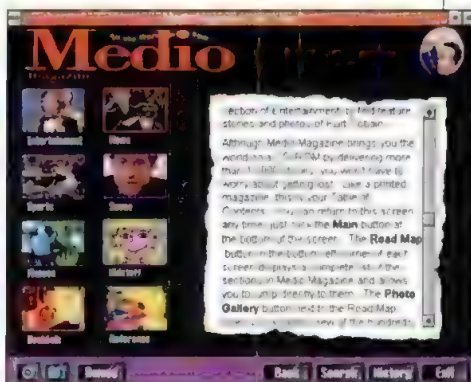
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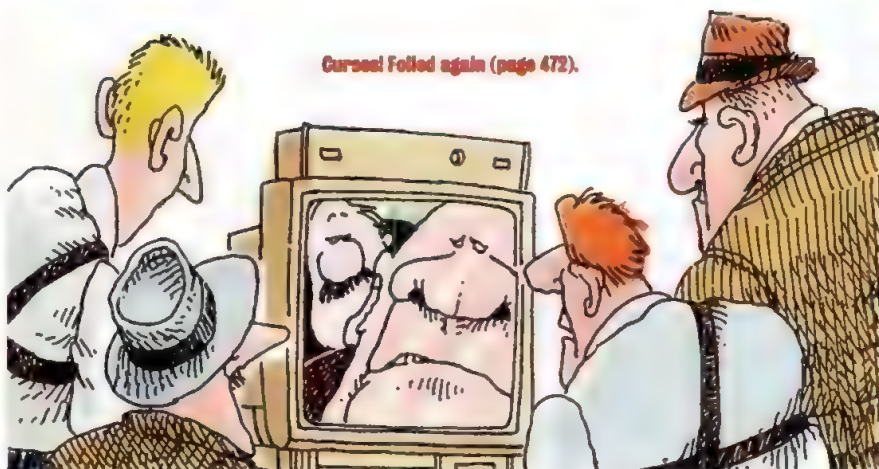
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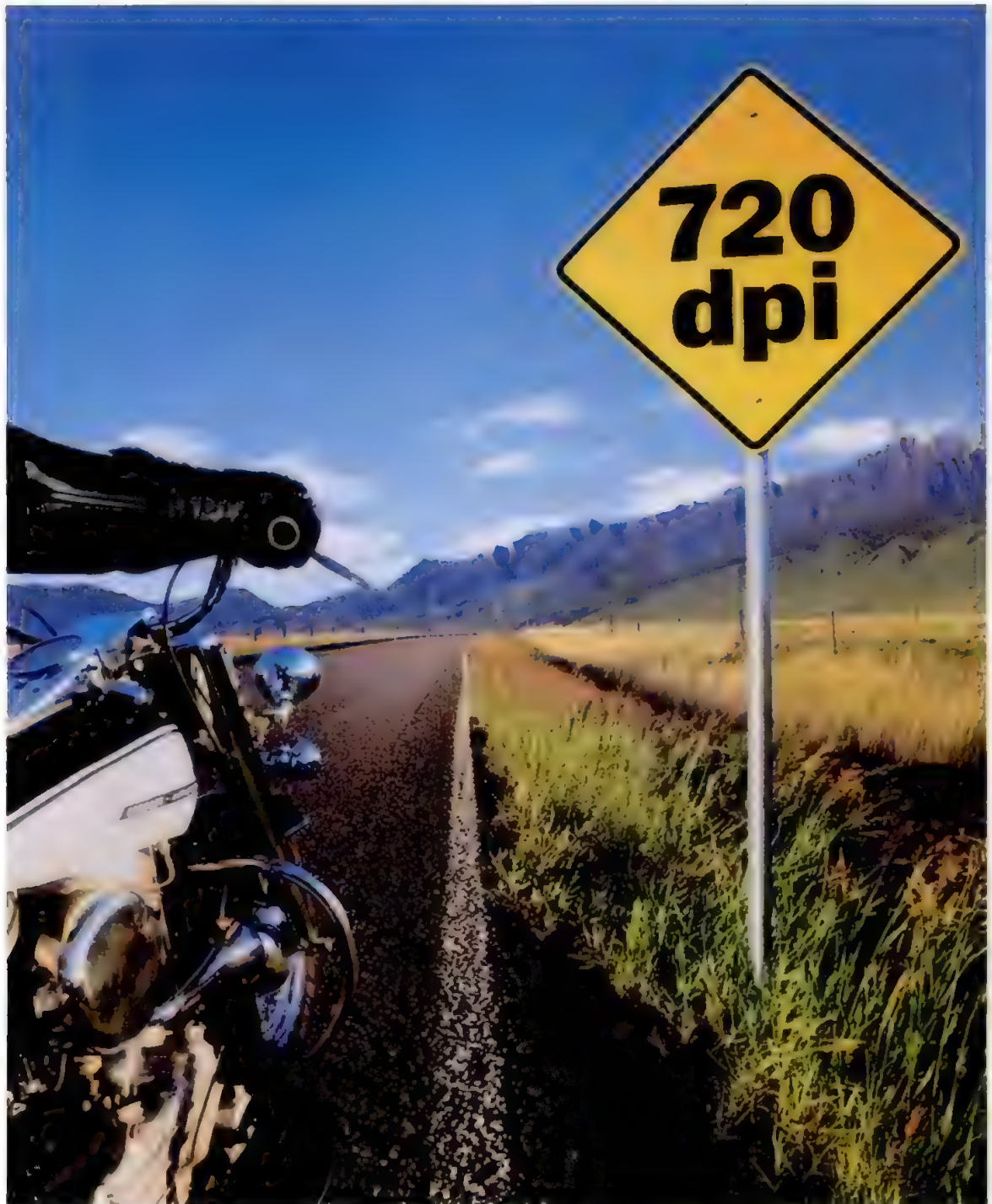
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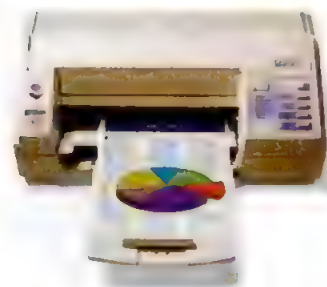




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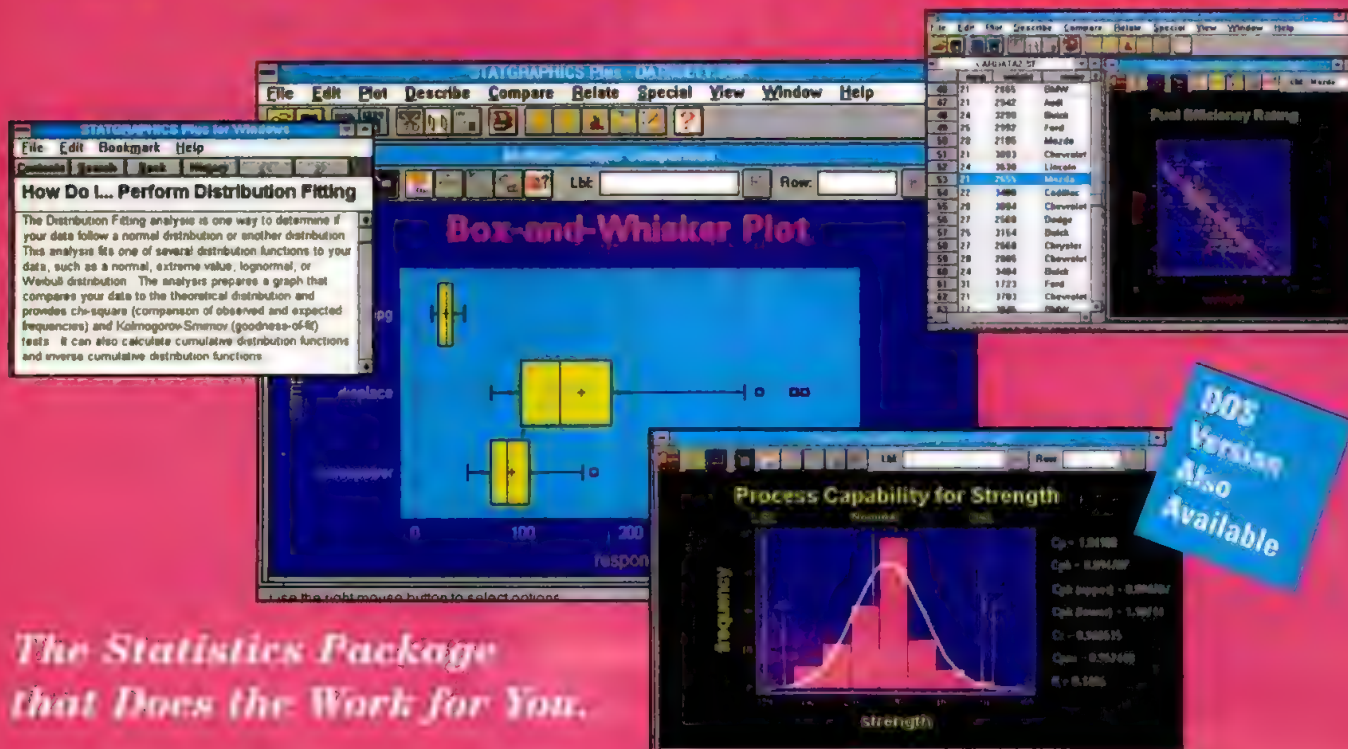
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Letters

THE PROS AND CONS OF RISC

There's nothing like good, clean, healthy competition! Look what the firefight between Intel's chips and Apple/IBM/Motorola's PowerPC is doing for processor performance and prices ("Battle for the Desktop," May 31, 1994). Now all we need is more of the same in the application-software world.

Marc Carter
via PC MagNet

PC Magazine has always been biased against the Mac in favor of the PC, but your PowerPC versus Pentium story went well beyond the usual Mac-bashing. You didn't mention that the PowerPC will be available with a PCI bus by the end of the year, and you tested spreadsheet performance only in emulation mode.

Kelly Black
via the Internet

• We tested emulated spreadsheet performance since no native Power Macintosh spreadsheets were available when we tested. The absence of native software means users will observe similar performance until new, native versions ship.—Ed.

At this time, the PowerPC is nothing more than a high-end Mac. Yes, it can emulate a PC, but not very well—and it's slow. I can't justify tossing out the hundreds of PCs already installed to jump on this bandwagon.

Dean Sullinger
via the Internet

Not all of the Power Mac applications in your comparison are native—PageMaker and Photoshop are just two of the exceptions—and you did not compare 3-D rendering software or CAD software, areas in which the Power Mac truly outshines the Pentium. In addition, the Power Mac version of System 7 (called System 7.1.2) is only about 10 percent native; Apple plans to make the rest of it native within 12 months. As System 7 becomes a fully native operating system and developers optimize their code for the PowerPC chip, Power Macs will get



There's nothing like healthy competition to improve performance and prices.

faster. Simply put, Power Macs will perform better in a year without any hardware upgrades.

Roger Chriss
via PC MagNet

The roundup of various workstations and operating systems was thoroughly enjoyable. It was a delight to read about machines other than x86-based PCs, and about operating systems other than Windows 3.1.

Suvro A. Basu
via the Internet

WRIST WRESTLING

May I suggest that Bill Machrone leave his patient-treatment advice at home ("Pigs, Ducks, and RSI," May 17, 1994)? Machrone should stick to what he's good at—writing about computers. We doctors and lawyers will push the computer industry to develop ergonomic and behavioral solutions to combat the very real physical problem of repetitive strain injury (RSI).

Robert C. Hiemstra, M.D.
San Diego, California

Machrone addressed a problem that is widespread in America: our obsession with lawsuits. It is unfortunate that as a

society, we are more interested in determining who should be blamed for RSI than in solving the real problem to prevent further injuries.

Robert S. Allen
via PC MagNet

Contrary to Machrone's offensive assertion that RSI is "an attitude thing," three years ago I was diagnosed with bilateral carpal tunnel syndrome while working at a job I loved; prior to the diagnosis, I had never even heard of RSI. It just so happened that my workstation's chair and keyboard were not adjusted properly for my body.

L.J. Kaye
Prospect Heights, Illinois

FOLLOWING THE YELLOW-BRICK ROAD

In his column "The Information Cow Path" (May 31, 1994), John C. Dvorak expresses the frustration that many customers have had when they try to get an ISDN connection. This year, Pacific Bell is doing several things to eliminate much of the frustration. We are moving quickly to provide ISDN throughout our California service area. About 70 percent of our customer lines today can get ISDN, and we plan to make ISDN available in all our central offices by the end of 1997. Since 1997 is still too long to keep customers waiting, however, effective July we are offering ISDN to customers even if their central offices have not been upgraded; this will make ISDN available to any Pacific Bell customer who wants it.

Kathie Blankenship
Director, Switched Digital Services
Pacific Bell
San Ramon, California

Dvorak's column on ISDN is right on target. Users want digital connectivity, and they want it now. Ironically, the phone system is largely digital already—except for the "last mile" to your home or office.

Bill Campbell
via the Internet

Amen to Dvorak's column. Many of the service providers won't listen to ISDN requests unless you can guarantee them vol-

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LETTERS

ume of at least \$10,000 a month. Maybe a little regulatory prodding would get the providers to wake up. Lots of little people can add up to a good reason for increasing bandwidth.

*David A. Youck
via the Internet*

The problem is too much regulation, not too little. The Baby Bells, which are charged with bringing us ISDN connections, are the only significantly regulated segment of the phone industry left. With the albatross of regulation, the Baby Bells have neither the necessary profit margins nor the competitive incentive to invest heavily in ISDN.

*Jeffrey A. Wolfe
via PC MagNet*

By stating that the Internet is out of control, Dvorak seems to suggest that not everyone should be allowed access to it. In a sense, the Internet is out of control—but then that just makes it like the rest of society.

*Noah Romer
via the Internet*

The Internet will certainly become a “central clearinghouse” for all sorts of information, both good and bad. But Dvorak’s fears are such a small piece of the whole that any attempt to control the Internet can have only detrimental effects on the dissemination of important and fruitful information.

*Jerry Whelan
via the Internet*

OVER THE [DESK] TOP

Kudos on your desktop publishing coverage (“Over the [Desk] Top,” May 17, 1994). I was amazed at the superb way you handled each topic and product. I’ve been struggling to decide which package to buy, and you made the decision a snap.

*Nathan Maxwell
via the Internet*

Thank you for the desktop publishing roundup. Anyone who’s starting a desktop publishing service will find the article quite

helpful. Finding the right program without spending a fortune is almost impossible; but with great articles like this, the arduous task of matching the right product to your needs doesn’t seem so hard.

*Melissa Davis
Grapevine, Texas*

486, WE HARDLY KNEW YE

No sooner had I finished reading Michael J. Miller’s column “The 486: A Final Requiem” (May 17, 1994) than I was greeted with the news of Commodore Semiconductor Group’s downfall. The latter engendered some sadness. Commodore made computers available to the average family and was responsible for introducing many of us to the wonders of personal computing. For this, Commodore will be fondly remembered.

*Mike McCaffrey
via PC MagNet*

So Miller has already eulogized the 486. Well, technology must change; no doubt, in a few years the 486 will be viewed as a quaint, interesting machine. But it won’t be forgotten so soon.

*Paul Gilbert
via PC MagNet*

CD-ROM TROUBLES

Congratulations to Jim Seymour on a fine column pointing out the inherent trouble with CD-ROMs (“What’s Wrong with CD-ROMs,” May 17, 1994). His view of CD-ROM drives and their technology is right on the mark, as are his remarks on CD-ROM software. Ever since Fall Comdex two years ago, CD-ROM software has seemed destined to be the wave of the future in computers—once a standardized interface and menu system is established. We may just have to wait a while for an acceptable future to come to us.

*Jeff A. Linscott
Colorado Springs, Colorado*

COMING TO A DORM NEAR YOU

Your article about technology on campus (Trends, “Technology on Campus,” May 17, 1994) struck a chord, as I’ve been taking my high school junior around to visit college campuses. It’s impressive to see how many schools have already wired their dorms so that students can dial the library catalog from their rooms, send e-mail on campus, and access the Internet.

*Michael A. Sandman
Brookline, Massachusetts*

CORRECTIONS AND AMPLIFICATIONS

Contrary to what we reported, the price of the WinBook XP with an active-matrix color screen (“The Spectrum of Choice,” August 1994) starts at \$3,999.

The correct phone number for VR Workshop from Media Synergy (New and Improved, July 1994) is 416-593-0647.

PC Magazine’s evaluation of RISC application servers (“One Size Does Not Fit All,” May 31, 1994) did not include the Logical Volume Manager in the configuration of the AT&T 3455; therefore, the AT&T system could not perform hard disk stripping. With the LVM installed, the system’s performance increased nearly 35 percent overall.

In our roundup of end user databases (“Balance of Power,” June 28, 1994), the correct phone number for ordering

information on Alpha Software’s Alpha Four, Version 3 or Version 4, is 617-229-2924; the fax number is 617-272-4876. The Summary of Features table in the same story incorrectly stated that Microsoft Access, Version 2.0, has no free technical support. Rather, Microsoft Access does not limit its free technical support.

HOW TO WRITE TO PC MAGAZINE

We welcome your comments and suggestions. Please send correspondence to Letters, PC Magazine, One Park Ave., New York, NY 10016-5802. You can send electronic mail to our Internet address 157.9301@mcimail.com, or you can upload it to PC MagNet (see page 12 for access information). You can also send e-mail to individual editors. Type GO PCMSTAFF on ZiffNet for a list of addresses. All letters become the property of PC Magazine and are subject to editing.

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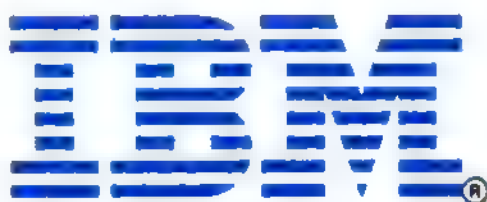
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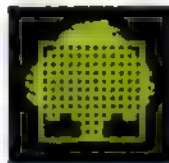
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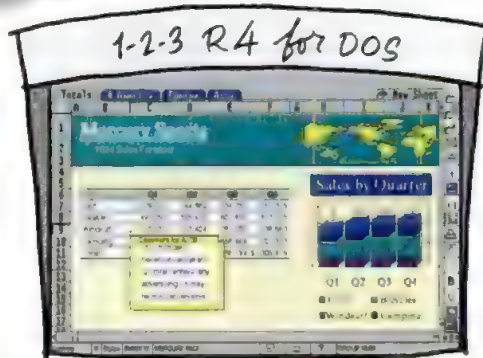
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Trends

TRENDS & TECHNOLOGY SHAPING THE PERSONAL COMPUTER MARKET

Finally, a Firm Handshake

Modem makers to adopt 28.8-Kbps standard

It's *almost* official: By the end of September, the ballots needed to ratify the V.34 modem specification are due from member countries of the International Telecommunications Union, a division of the United Nations. Also known as V.Fast modems, V.34 (pronounced

"V dot thirty-four") modems pump 28.8 thousand bits per second uncompressed, and V.34 may well be the last modem standard before ISDN's digital 64-Kbps standard takes over.

V.34's ratification comes at the expense of nonstandard modem specifications such as V.Fast Class (V.FC), another 28.8-Kbps data-modulation scheme, and may leave users clamoring for upgraded modems that conform to the new spec. (For more details, see our evaluation of modems, "Hurry Up and Wait," in this issue.)

Based on a chip from Rockwell International, V.FC modems started shipping a year before the standard was solidified. According to Dennis Hayes, president of Hayes Microcomputer, there may be 1 million V.FC modems installed by the time V.34 becomes official. Companies that make V.FC modems, such as Boca Research, Hayes, Microcom, Practical Peripherals, and Supra, promised an upgrade if V.34 is accepted over V.FC.

In most cases, the component you'll need to exchange is soldered to a modem's system

board, so you'll need to send your modem back to the manufacturer, who can replace the component. Practical Peripherals, which charges \$89 for the factory upgrade, expects a 48-hour turnaround time. Hayes offers a tiered upgrade plan: Pay \$49 for a two-day turnaround, or pay extra, and Hayes will send you a new modem before you return the old one.

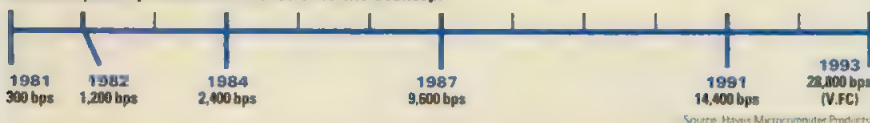
Some vendors simply waited until V.34 seemed imminent. MultiTech System recently shipped the MultiModem II, which uses an AT&T chip based on a draft of the V.34 spec. (See First Looks in this issue for reviews of the first V.34 modems.) Even if the final spec changes, you won't have to send this modem back for an upgrade because it uses flash memory-based ROM that you can update by dialing into a bulletin board.

Modem vendors will post upgrade plans on company bulletin boards, in public forums such as CompuServe, and in materials at retail stores. Contact your modem vendor for specific options and costs.

—Christopher Barr

A Glance Back at Modem Speeds

In 1981, a top-of-the-line Hayes modem ran at 300 bps. Today, the top speed is 28,800 bps. According to Dennis Hayes, founder of Hayes Microcomputer Products, V.34 may be the last modem standard before ISDN's 64,000-bps standard moves onto the desktop.



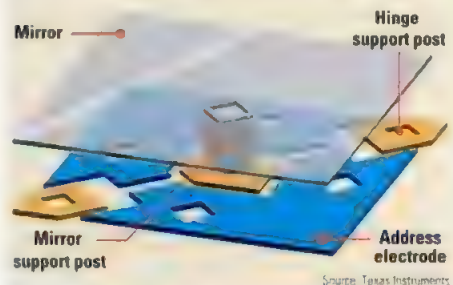
Mirror, Mirror, On the Wall

For more than a decade, Texas Instruments has been developing a technology called a digital micromirror device (DMD), an electro-mechanical chip that TI hopes to use in high-resolution projection displays. Unlike liquid crystal displays, which generate images by passing an electrical current through the liquid crystal material, DMD systems reflect light from a powerful source onto a wall or screen.

The DMD chip itself has up to 2.3 million tiny aluminum mirrors balanced on microscopic support posts that reflect the light. The mirrors, made of highly reflec-

Tiny Projector, Big Picture

The microscopic mirrors in TI's DMD chip will be built into next-generation high-resolution projection displays. Each chip contains up to 2.3 million mirrors.



tive aluminum alloy, measure only 16 microns (16 millionths of a meter) square and can be seen with the aid of a low-power microscope. Each mirror is suspended over an SRAM cell. Arranged in an x,y matrix similar to the 640-by-480 matrix of an LCD, each DMD contains row and column drivers that control the SRAM cell beneath the mirrors. Electrodes that run diagonally under each mirror cause the mirrors to tilt depending upon where the reflected light is to go.

While DMD technology may sound impossibly precise, TI claims it can project images larger than 40 inches diagonally with a contrast ratio greater than 100:1, which is brighter than most active-matrix LCD panels. TI says that a three-DMD chip display is capable of 24-bit color and resolutions of up to 2,048-by-1,152. —Christopher Barr

Pipeline *By Robin Raskin* Is RAD the Next Fad?

get to watch more than my fair share of software demos, and finding a common theme among them is one of my favorite pastimes. These last few months, the theme is clear: It's RAD (rapid application development). A growing number of tools, applications, and strange hybrids tout themselves as RAD tools. Though each is a very different beast, all the RAD wannabes have several things in common.

► They're visual. Products such as Borland's still-to-come Delphi, IBM's Visual Age, Microsoft Visual Basic (VB), and Symantec's Enterprise Developer typify the category. Each provides a highly graphical integrated environment for quickly building and deploying apps.

► They're object-oriented. They all follow the traditional object-oriented model that includes inheritance, polymorphism, and encapsulation.

► They have roots in established languages. VB is based on BASIC, Delphi on Pascal, and Visual Age on SmallTalk.

► They seek new ways to cut application-development time. A good deal of the RADness comes from strong tools for building user interfaces and a "component" approach to app building.

► They took far longer to build than their developers ever anticipated. Theoretically, the payoff for RAD comes once the long process of developing the tools is complete.

A brief history of the RAD fad indicates that the concept is not particularly novel or successful. HP New Wave, NeXT's



NextStep operating system, and Xerox PARC's SmallTalk all exhibit RAD-like behavior. Both Borland and Micrografx were early proponents of RAD, which even they admit cost valuable development time; they are only now beginning to recover.

The folks at Symantec, creators of Enterprise Developer, posit that part of the problem with object-oriented code is that no one is reusing the objects. Only about 15 percent of code gets reused when the figure should be more like 85 percent.

The new RAD tools are supposed to make reusing code easier. I'd like to formulate a theory here. Let's call it Robin's RADness Ratio. I'll wager that the more RAD a tool is—that is, the faster you can develop apps—the more app-specific that tool is.

C++, for instance, wasn't optimized to perform one specific function. It's a wide open environment, so it takes a while to develop a C++ app. VB, on the other hand, assumes you'll design a UI or form first. Enterprise Developer, ObjectView, and PowerBuilder are all geared to creating client/server apps.

Next, I'll bet that the more RAD a tool is, the more time it takes to develop it. The Taligent folks are attempting to create the ultimate RAD environment by writing zillions of generic frameworks that can be strung together to create a complicated app very quickly. It's hard to say whether Taligent is creating an operating system, a development environment, or a bunch of components, but we know it's taking a long time. What remains to be seen is whether this up-front work translates into sleeker, faster implementations of apps.

There will be many RAD tools available this year, and deploying new apps will involve a trade-off between toolset restrictions and the time it takes to build an app. One thing's for sure: In my book, RAD stands for Rapidly Appearing Demos.

Robin Raskin is editor of PC Magazine.

Live Picture: Score One for the Mac

IT'S MAC ENVY ALL OVER AGAIN, thanks to a revolutionary image-editing program that's not available on the PC, at least not yet.

Live Picture, developed by Paris-based FITS Imaging and published here in the U.S. by HSC Software (310-392-8441), makes high-end image-editing workstations seem obsolete. Even when working with huge picture files of several hundred megabytes, Live Picture provides blazingly fast screen updates and unlimited undos.

Most amazing for a raster (bitmapped) graphics program is an unprecedented degree of resolution independence. The key to Live Picture's power is its two proprietary file formats: IVUE and FITS. The IVUE file contains a high-resolution scanned image plus several lower-resolution versions. Although the IVUE file is larger than a normal raster image (such as a TIFF or JPEG

file), response time is faster because Live Picture processes only the necessary pixels for the current screen resolution and zoom level rather than the entire image.

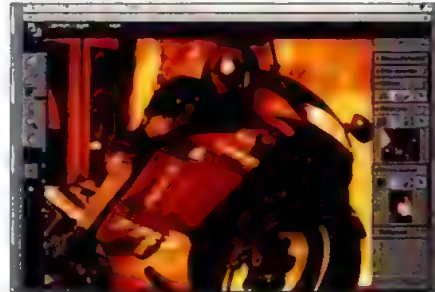
All of the processing instructions—including filter effects, color correction, masks, and brush strokes—are stored in a Functional Interpolating Transformational System (FITS) file as pure mathematical expressions, so all of Live Picture's internal operations are resolution-independent. Indeed, if you were to paint a picture from scratch, you could theoretically print at any size without resorting to pixel interpolation.

On a more practical level, the FITS file allows users to backtrack through commands and selectively undo, modify, or reorder the operations. For example, if you

blurred a picture, corrected the color balance, and changed its dimensions, you could undo the blur without affecting the other two commands. Even more impressive, the FITS raster-image processor (RIP) is smart enough to ignore operations that cancel

each other out. So if you rotate an object by 45 degrees and then rotate it by another 10 degrees, Live Picture will condense these operations into a single 55 degree rotation.

Live Picture needs 32MB of RAM and costs \$3,495—a bargain when you consider that it effectively turns a Mac Quadra into a competitor of



By storing image-editing functions mathematically, the FITS technology in HSC Software's Live Picture lets you edit high-resolution, multimegabyte images in real time.

the Quantel Paintbox or Scitex workstation. Though there are no current plans for a PC version of Live Picture, HSC is evaluating the Windows-based high-end graphics market. —Luisa Simone

MPEG Milestones

THE QUALITY OF THE VIDEO YOU can play on your PC depends on the compression method used to create and play back the video. MPEG, a hardware-based approach requiring a dedicated chip for decompression, delivers full-screen video playback. Intel's Indeo, Microsoft Video 1, and SuperMac's Cinepak use software-based decompression and typically play video back in a frame that's 1/8 or 1/16 the size of your screen.

Following the success of MPEG-based solutions, graphics-board vendors are now climbing aboard the MPEG-compression bandwagon. Microsoft even plans to support

MPEG playback in Chicago, the next version of Windows expected this year.

The first vendor to offer a dedicated MPEG playback system was Sigma Designs. Its ReelMagic board decodes MPEG files and plays them back through a separate MPEG decoder board attached to the feature connector on a computer's VGA card.

Vendors of MPEG boards are taking three approaches to design. Like Sigma Designs, Creative Labs (maker of Sound Blaster boards) is designing an MPEG play-

back board that attaches through the VGA feature connector; it should be in stores this winter. Other designs use the VESA Media Channel (VMC) connector, which is appearing on an increasing number of graphics boards. VideoLogic's MPEG Player attaches to any VGA card's VMC connector. And in October, Matrox Electronic Systems will ship a daughtercard that attaches to the Matrox Impression Plus graphics board via the VMC connector.

Finally, some vendors plan to incorporate the MPEG hardware right onto the graphics board, obviating the need for an additional card. Jazz Multimedia's Jakarta and RasterOps' Video Impact boards contain both graphics accelerators and MPEG playback hardware.

The battle over an MPEG standard is being fought between Sigma Designs and the 60 members of the Open PC MPEG consortium. At stake is DOS compatibility of MPEG applications. A Windows API is nearly in place, and both sides agree that a single standard is needed. A truce is expected soon.—Christopher Barr



In *Return to Zork*, MPEG video requires a hardware assist to play full-screen at 30 fps.

Top Retail Software		
Current ranking	Last issue	Product, company
1	—	MS-DOS 6.22 Upgrade Microsoft Corp.
2	—	Procomm Plus for Windows 2.0 Datastorm
3	12	QEMM 7.0 Quarterdeck Office Systems
4	6	MS Office 4.2 for Windows Upgrade Microsoft Corp.
5	5	MS Windows 3.11 Microsoft Corp.
6	—	MS Excel 5.0 for Windows Upgrade Microsoft Corp.
7	—	MS Word 6.0 for Windows Microsoft Corp.
8	—	MS Access 2.0 for Windows Upgrade Microsoft Corp.
9	—	MS Office 4.2 for Windows Microsoft Corp.
10	3	WinFax PRO 4.0 Delrina Technology
11	—	Sidekick for Windows Borland International Inc.
12	—	Lotus 1-2-3 for Windows, Release 4.01 Lotus Development Corp.
13	13	Corel Gallery 1.0 Corel Corp.
14	—	WordPerfect Office 4.0 WordPerfect Corp.
15	11	MS Works 3.0 for Windows Microsoft Corp.

This list ranks PC business programs according to the total number of copies shipped to stores and resellers in the week ending July 2, 1994. The list is based on shipments to more than 12,000 retail locations. It does not include sales made directly by software publishers and cannot be interpreted as a picture of the entire software market. Sales information adapted from a compilation from Ingram Micro.

Putting the Squeeze on Voice

WHILE MPEG LOOKS LIKE THE compression standard of choice for full-motion video, DSP Group's TrueSpeech compression technology is the leading compression choice for voice.

There are several useful ways to expand bandwidth to carry increasingly complex data, such as video, voice, and graphics. But another approach is to use the bandwidth you already have more efficiently by putting the squeeze on the data. "Human speech is too big a data object to travel around freely on the desktop," says Asaf Mohr, vice president of DSP Group, a software developer making strides in speech-compression technology. Working in labs in Silicon Valley and Israel, engineers are improving voice-compression algorithms so that sound can be stored more efficiently. The advances are opening new frontiers in real-time voice compression and digital voice mail.

Based on mathematical algorithms

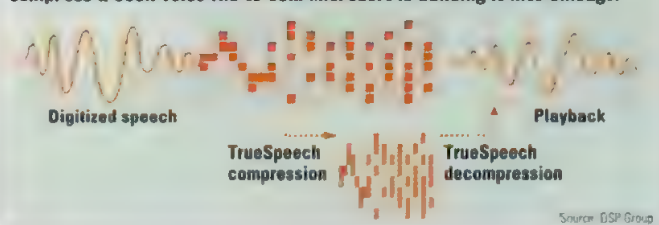
derived from the way airflow from your lungs is shaped by the throat, mouth, and tongue when you speak, TrueSpeech can compress a 900K file—a minute of voice data—to a 60K file by throwing out redundant and unnecessary information about the sound. "This takes a combination of pure mathematics and good ears," explains Mohr.

The key to achieving smaller file sizes is to decrease the *bit rate* (the amount of data required to describe speech) at which a voice is recorded. Today, TrueSpeech compresses voice at 8.5 Kbps; improvements of 50 percent are achieved every two years, says Mohr.

TrueSpeech is off to a good start: It is already embedded in Microsoft Windows Sound System, and Microsoft has adopted

Chicago Speaks TrueSpeech

TrueSpeech, DSP Group's digital speech-compression algorithm, can compress a 960K voice file to 60K. Microsoft is building it into Chicago.



it as the speech-compression tool in Chicago. It has also been adopted by semiconductor makers Analog Devices, Intel, and Motorola, and DSP Group is actively participating in U.S. and international standards groups.—Carol Levin

Mile-High Memory

JUST OVER TWO YEARS AGO, WE reported on Intel's debut of a flash memory card with an unprecedented capacity of 20MB—five times the capacity of the previous generation of cards. Around the same time, a little-known chip designer was working on a high-density storage technology that would one day far surpass previous efforts. In the future, one gigabyte of flash memory on a PCMCIA card may be an affordable option.

The impetus is clear: "The amount of memory you need doubles every year," says Chet Brown, CEO of Cubic Memory. That's a good thing for this Scotts Valley, California, company, which has devoted the past five years to engineering a high-density memory-packaging technology called *vertical wafer integration*. This fall, Cubic Memory will ship its first products, including DRAM modules of up to 128MB.

How do you squeeze a gigabyte of memory into a cubic inch of silicon while keeping costs on a par with existing technology? The secret: Stack the silicon wafers. In Cubic Memory's vertical integration process, layers of DRAM memory chips are stacked and connected by gold wires that run to the beveled edges of the wafers, where they connect to a conductive silver epoxy.

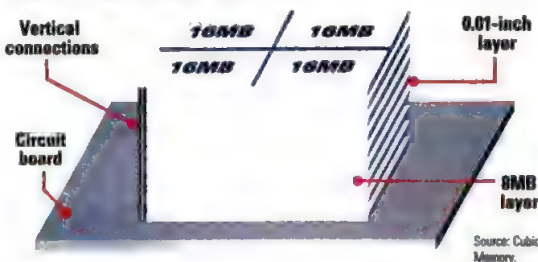
Existing memory-packaging designs can have maximum densities of between 40MB

and 80MB per cubic inch using 16-megabit DRAMs. Meanwhile, Cubic Memory has built a PCMCIA Type I card that can easily hold 128MB of memory; the ultimate goal is a 1GB card.

Vertical integration also works with flash memory chips, which can be used as an alternative to power-hungry magnetic hard disks in notebooks. Unlike DRAM, flash memory does not require electricity to hold data.

This isn't the first attempt at developing

Vertical Wafer Integration
An 8-layer stack of DRAM wafers holds 84MB and is 0.08 inches high. A 16-layer stack holds 128MB.



a high-density memory structure. Dense Pac, Intel, Irvine Sensors, Matsushita, RTB Technology, and Texas Instruments have developed similar solutions. Cubic Memory has managed to keep costs low by streamlining the production process to only ten steps.

Meanwhile, NEC and SunDisk plan to develop a 256Mb flash memory chip by 1997, to be used in future flash cards. SunDisk estimates that in 1997, flash memory will cost \$3 a megabyte, compared with \$50 a megabyte last year. A 20MB card that costs \$1,000 today will sell for \$100 in 1997. That's a lot more memory for your money.—Carol Levin

Digital Visionaries

BILL GROSS WENT OUT ON A LIMB in 1991 when he left Lotus to start Knowledge Adventure, a company focusing on software that both educates and entertains children. Since then, the home market has exploded, and Gross's Adventure programs have been a smashing success. In June, filmmaker Steven Spielberg joined forces with Gross, 36, to create the next generation of entertainment software.

Q: What technology is fueling the next wave of kids' software?

B.G.: Better video compression, more color depth, higher processing speed, 3-D sound, and greater densities on CD-ROMs will allow us to make more powerful visualization tools for kids. Everything that can make an experience more visually realistic and responsive.

Q: What will be the minimum platform for the home?

B.G.: Pentium power will be all over the home. CD-ROM, 8MB of RAM, 16-bit stereo sound will be the standard. And CD-ROM will be surpassed by something else, whether it's cable to your cable TV box, or fiber-optic line direct to your home with a full network bandwidth, or a small RAM-based card. CD-ROM is not the final medium of delivery, but for right now, it's the most incredible delivery vehicle of all time.

Q: How did you begin with Spielberg?

B.G.: He wanted to participate in the education revolution, and we share a very similar excitement about the education of our children. He felt there were ways to make products more compelling. We're the masters of the technology and the educational content, and he's the master storyteller of all time.

Q: Will Spielberg take an active role?

B.G.: He'll be very heavily involved in our new products. He can take an idea and flesh it out right in front of your eyes. He'll contribute storytelling elements and design ideas, connect us with partners to create content, and [also link us] with people in Hollywood.

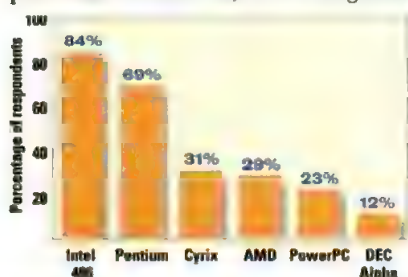
Right now, there's so much creativity possible with the PC, that even technologists with good ideas can't take full advantage of it. Hollywood has mastered storytelling and drama. Making that connection work is part of the challenge, and I think we have a great chance of really making it work in one of the best ways ever.—Melissa J. Perenson



Kids' play.

Briefs

INTEL 486 AND PENTIUM CHIPS LED THE pack when we asked 2,700 PC Magazine



subscribers what types of processors they plan to purchase in the future. Their choices are indicated in the bar chart above.

NEW ON THE NET: THE DIGITAL FREEDOM

Network, launched recently by International Discount Telecommunications, posts banned writings of political dissidents from around the world. The first works to go on-line are from writers Wei Jingsheng of China and Pramodya Ananta Toer of Indonesia. (The Internet address is gopher.iaa.org.)

► The Pipeline, an Internet-access service for the New York City area, now offers local-access phone numbers across the U.S. and overseas. Contact The Pipeline at 212-267-3636 (phone), 212-267-4380 (fax), or info@pipeline.com (e-mail).—Carol Levin

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- IDE hard drive upgradable to 350MB.
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- High-speed local bus video with 1MB video RAM.
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DX4-100	\$3095	Lease \$102/month
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CIRCLE 036 ON READER SERVICE CARD

Let's talk scanners.

AT MICROTEK, WE DON'T MAKE COMPUTERS AND WE DON'T MAKE

Whatever you buy a scanner for — document management, desktop publishing, high-end graphic arts — you want the best scanned image possible, the most advanced features and the highest value for your hard-earned dollar.

That's why people who know, pass up the "johnny-come-latelies" in the scanner business and go straight for the first name in scanners: Microtek.

A REPUTATION FOR INNOVATION.

While many of the names in today's scanner market were still making computers, laser printers...or even radios, of all things, Microtek was racking up an impressive array of firsts in scanners.

Microtek brought the first halftone desktop scanner to market in 1984. Microtek was also responsible for the first 256-tone grayscale scanner, the first affordable desktop color scanner and the first affordable 35mm slide scanner. With the recent introduction of Dynamic Color Rendition (DCR), Microtek produced the

first automated color calibration and correction system. And now, with the ScanMaker III and ScanMaker 45t, we're the first to market with honest 36-bit desktop color scanners.

AFFORDABLE QUALITY.

Don't need color scanning capabilities? Then don't buy them. The Microtek ScanMaker IIg is a great 300 x 600 gray-scale scanner with a street price starting around \$400.

Want color but still don't want to spend big bucks? Look into the ScanMaker II — you get 24-bit color flatbed scanning and Adobe Photoshop LE for around \$550.

Looking for a fast, single-pass scanner for office and graphic applications? The ScanMaker IIsp is the winner of two important Editors' Choice Awards from *PC Magazine* and from *Imaging* magazine. It has software enhanced resolution of up to 1200 x 1200 and a street price of around \$750.

For more sophisticated applications, there's the ScanMaker IIhr.

You'll get software enhanced resolution up to 2400 dpi — which makes it very popular with



Microtek's Family of Scanners includes: ScanMaker III, ScanMaker IIhr, (both shown with optional transparency adapter), ScanMaker 45t, ScanMaker IIsp and ScanMaker II.



PRINTERS. ALL WE MAKE ARE THE BEST SCANNERS YOU CAN BUY.



graphic artists — and a price of around \$1100, which makes it very popular, period.

68 BILLION COLORS.

With 36-bit color resolution, the ScanMaker III and ScanMaker 45t

are working with far more data than any 24- or even 30-bit scanners. A palette of 68-billion colors means unparalleled richness and depth, clarity of detail and color accuracy that rivals machines costing much more.

The ScanMaker III is a fast, single-pass flatbed scanner with DCR color calibration, software enhanced resolution up to 2400 dpi and a street price under \$2700.

You read it right, under \$2700.

For real high-quality work, the ScanMaker 45t offers photographers and graphic artists up to 2000 x 2000 dpi software enhanced resolution for scanning transparent images up to 5" x 5". It costs about \$6500 and offers a level of quality that — until now — was only

available to professionals using costly drum scanners.

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No matter how much money you have to spend, you'll find your best value is with Microtek. For example, most Microtek scanners come with Adobe Photoshop or Adobe Photoshop LE at no extra cost.

Microtek is the world's largest desktop scanner manufacturer. We've made more scanners, longer, and have a history of more scanner awards and innovations than anyone else you can name. And since we don't divide our attention between computers, printers and miscellaneous consumer products, we can concentrate on making the finest products in the scanning business. For your free copy of our scanning primer *The Scanned Image*, more information about scanners and Microtek in particular, just call us at 800 654-4160 or fax a request to 310 297-5050.

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CIRCLE 091 ON READER SERVICE CARD

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CIRCLE 254 ON READER SERVICE CARD

First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

Communications

Procomm Plus: An All-in-One Communications Punch

BY RICK AYRE

Over the years, Datastorm Technologies has built a very healthy one-product software business by carefully expanding the communications abilities and ease of use of Procomm

Plus. Datastorm takes another step forward with Procomm Plus for Windows 2.0 (PW2, \$179), which goes beyond an improved look and feel to integrate many features that either are treated as add-ons or are not incorporated as smoothly by other packages.

A veritable wish list of new features has been incorporated into Procomm Plus for Windows 2.0. The most notable improvements are integrated fax sending and receiving, an auto-detect feature that recognizes and configures modems and serial

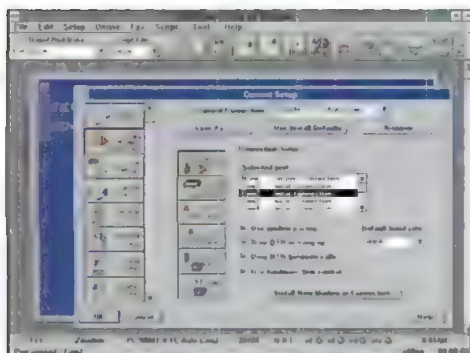
ports during installation, and a PC file-translation utility. The end result is a full-featured communications center that's much easier to use, more attractive to look at, and has just about everything a PC user could want.

Compared with other total communications packages, such as Delrina's WinFax PRO or Traveling Software's CommWorks for Windows, PW2 better integrates the separate elements into a cohesive whole, without sacrificing the functionality of the individual pieces. With PW2, as much time was spent on each part as was spent on making them work together.

EASY TO START

Installation of the program's four floppy disks was quick and

Continues on page 38



CHOICES: The Current Setup dialog box in Procomm Plus neatly organizes options (in a column to the left) and current settings.

Portable PCs

Power Without the Brick: The Compaq LTE Elite 4/75CX Lightens the Load

BY WILLIAM P. FLANAGAN

In a move that has been surprisingly long in coming, Compaq Computer Corp. has taken the next logical step in minimizing the traveling executive's load. By integrating the AC adapter into the case design of its LTE Elite line of notebooks, Compaq has not only eliminated the need for the bulky power brick but also has created a series of one-of-a-kind notebooks that weigh in at less than 7 pounds each.



POWER ELITE: Compaq's high-end notebook incorporates the power adapter into its case to save on clutter and weight.

The difference between products in the Elite line and notebooks from other vendors is readily apparent when you look at the back of each unit. The absence of the power adapter can be jarring until you see the small circular fan from the system's integrated power supply. The fan, which cools the system only while it is plugged into a wall outlet, does not affect battery life.

From the rounded look to the improved system architec-

ture, this is clearly a new generation of LTE notebooks. Improvements over the LTE Lite line, which the Elite line replaces, include the long-awaited incorporation of PCMCIA slots. The Elite family also represents the debut of plug-and-play capabilities in portable PCs.

CORPORATE STANDARD

The Elite line is being marketed as a family of full-featured notebooks that include several choices. Three new docking stations give users a variety of expansion choices, which will depend on individual preference and need. To begin with,

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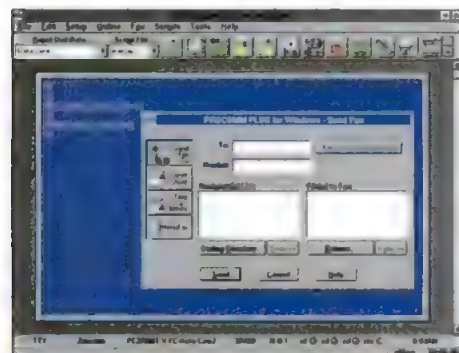
Procomm Plus

CONTINUED FROM PAGE 37

simple. During setup, the new auto-detect feature interrogates your computer to discover what kind of serial ports you have installed and what kind of modems you have attached to them. We tested PW2 on a number of different modems; it didn't always name the modems correctly, but it always picked

make more sense to Datastorm designers than to typical PC users. The Current Setup dialog box—really a series of dialog boxes—is a visually unique way to show the detail of the hierarchical menus. As you cycle through choices, the settings available under each choice are clearly visible next to the selection.

While the improved interface is more straightforward, it can still be frustrating. For example, you can see the modem's speaker settings from inside the Current Setup dialog box by clicking on Data Modem Commands and opening the Advanced box. But you can change the volume only by choosing Setup from the main menu and selecting Modem Speaker Volume. And to change a phone



SEND: Procomm Plus allows you to fax directly from an application or use the new Send dialog box.

the correct modem type whose commands it could use effectively. The program currently supports 700 different modems, and more will be added by Datastorm in the future.

The automatic modem detection feature is as close to magic as software gets these days. It's especially good news for users who don't keep track of the locations of their serial ports or the kinds of chips on those ports; Procomm Plus turns a frustrating chore, which most PC users hate, into a no-brainer. With its new auto-detect feature, Datastorm is making a statement: Don't bother. We'll do it for you.

CASCADING CHOICES

Datastorm has also made it easier to set up communications preferences, though some choices are still organized in ways that

number's prefix (to get an outside line, for example), you need to open the Dialing Directory and select Options.



From August 29 through September 2, you can go on-line to discuss Procomm Plus with PC Magazine executive editor Rick Ayre and with Ron Bower, Director of R&D at Datastorm. Type GO EXEC at any CompuServe prompt.

But significant improvements have made PW2 easier to use. The program's Action Bars are now customizable, and a Quick Select bar allows point-and-click changing of, among other things, emulation and transfer protocols. PW2's scroll-back buffer now holds up to 1,300 pages; the package incorporates many extensions to the Aspect scripting language (see "Aspect Comes of Age"), which takes this language to a new level. There is also support for drag-and-drop, both to and from the Windows Clipboard.

Standalone status is augmented with network links: MAPI is built in so that you can easily forward e-mail or faxes.

■ Aspect Comes of Age

The Windows Aspect Script Language (WASL) has evolved slowly. Beginning as a traditional communications scripting language, it has become a much more complete Windows programming environment that can automate many routine communications functions. Procomm Plus for Windows 2.0 gives you not only WASL but also new editors for source code, dialog boxes, and creating windows. With these tools, even novice programmers can create powerful communications scripts with true Windows interfaces.

Two included sample programs show Aspect's depth: the MCI Manager and the CIS Manager. These two programs (which automate use of MCIMail and CompuServe, respectively) make it clear that many of your communications activities can be automated and that interface complexities can be masked from users.

There is also support for PW2's new fax functions and the ability to do both single- and multidimensional arrays. Another plus: Datastorm has eliminated the memory limitations formerly encountered when compiling large scripts.—RA

Procomm Plus also has network support for NCSI/NAI and NetBIOS.

MAINFRAME-TO-PC

With the addition of the IND\$FILE transfer protocol (for those who need to connect to IBM mainframes), PW2 now supports most major file-transfer protocols. With the addition of NetBIOS support, PW2 runs on all the important networks—with one very important exception.

Though TCP/IP was rumored to be a part of PW2, the protocol isn't included in this release of the program. The inability to do SLIP or PPP from inside PW2 is this product's major shortcoming and will probably be missed by those who see the Internet as the future of interactivity. According to Datastorm, an interim release that addresses this deficiency will most likely be free to those who purchase or upgrade to PW2.

The integrated fax functions Datastorm brings to Procomm Plus are all that most people need—almost. You can send, receive, view, flip through, and print faxes, but you can't annotate them. Those who want to

attach a signature to a fax are out of luck. You can fax a document either through Procomm Plus's dialog box or through an application. The program supports Group 3 fax protocol and includes a fax viewer that can zoom in on selected areas of the document.

Despite its blemishes, Procomm Plus lives up to the Procomm heritage. It is both more reliable and easier to use than its market-leading predecessor. Integrated fax and auto-detect features raise the performance bar for competitors. Other vendors have added similar features, but they either don't work as well or aren't as well thought-out.

There is still room for improvement in PW2. But for now, Procomm Plus for Windows 2.0 is the best communications package for power users and novices alike.

► **Procomm Plus for Windows 2.0.** List price: \$179; upgrade, \$69. Requires: 4MB RAM, 8MB hard disk space, Windows 3.1 or later. Datastorm Technologies Inc., 2401 Lemone Blvd., Columbia, MO 65205; 800-315-3282, 314-443-3282; fax, 314-875-0595.

Circle 436 on reader service card

Compaq Elite

CONTINUED FROM PAGE 37

the Compaq SmartStation (\$700) is the closest thing we've seen to a clone of Apple Computer's superb Duo Dock. To ensure a solid connection, the SmartStation loads the notebook VCR-style, even while the unit is turned on. The SmartStation offers built-in Ethernet and SCSI ports for networking and additional device connections. Two standard ISA slots and two drive bays are also present.

If this is too much connectivity at too high a price, Compaq offers the MiniStation/EN and the MiniStation/TR. Each of these network docking stations offers a SCSI interface and the choice of either Ethernet or Token-Ring networking. They sell for \$331 and \$400, respectively. Through the use of an adapter, Elite notebooks are also compatible with the current LTE docking station and vice versa.

SIGHT AND SOUND

For further versatility on the road, Compaq offers the Opti-Byte Media Station (\$1,599), manufactured by AccuMem Systems. This unique docking station integrates 16-bit sound into the notebooks. Its features also include a pair of speakers, one 16-bit ISA slot, and a SCSI-2 connection for additional devices.

By including a double-speed CD-ROM, the Media Station adds a new dimension to portable computing. The Opti-Byte system, which weighs 6 pounds, fits underneath the Elite and adds 4 inches to its height.

PNP ON THE ROAD

Compaq, which has been part of the vanguard of the evolving Plug and Play standard, has made easy configuration a vital part of the Elite notebooks. Even before the expected introduction of Microsoft's revision

of Windows (alias Chicago), many plug-and-play features have been incorporated into the Elite systems, which can automatically configure a number of devices—from a large variety of PCMCIA cards to an external monitor and keyboard—without rebooting.

Elite notebooks come with DOS 6.2, Microsoft Windows 3.1, and Compaq's TabWorks preinstalled, as well as a number of Compaq utilities. These include an easy-to-use Windows-based power management utility. Standby and Hibernation are two features of this power management scheme. The Hibernation mode writes all data to the hard disk before it shuts the system down. When the system is turned back on, all data is retrieved, returned to memory, and displayed exactly as it was when the user left off.

The unit we tested was configured with a 75-MHz DX4 processor, 8MB of RAM, a 340MB hard disk, and a 9.5-inch-diagonal active-matrix color screen. It sells for \$5,999. On our benchmark tests, the system was consistently an average performer, straying slightly above and below the average for DX4/75 notebooks on individual tests.

The Winstone score, which

nation turned on, this showing was extended to more than 7 hours, making the Elite a full-day notebook.

Consistent performance, however, is only part of this system's appeal. User-upgradable features include disk drives that are easily removed, with options ranging from 170MB to 510MB; system memory is

expandable to 24MB. System models range from a DX2/40 unit (\$3,299) to the tested DX4/75 system (\$5,999). According to Compaq, a 100-MHz version is on the way.

PCMCIA SLOTS

The Elite notebooks break new ground for the Compaq LTE line by incorporating PCMCIA. The value-priced Contura family received this upgrade a year ago, but PCMCIA is only just appearing in the company's flagship line. Each Elite system has two Type II PCMCIA slots that can house a single Type III device.

The Enhanced EasyPoint Trackball is positioned just to the right of the screen and has



COOL RUNNING: With the power adapter inside, the Compaq LTE Elite 4/75CX requires a built-in cooling fan when it is plugged in.

monochrome display—which remains unique among PC notebooks—to the active-matrix color display featured in the product we tested. The Elite design, however, lacks both a 10.4-inch screen—a disadvantage for those who do presentations on the road—and the integration of a sound chip. In these two areas, the IBM ThinkPad 755C sets the pace.

With the Elite line, Compaq has put together some of the most versatile and powerful notebooks on the market today. It will be just a matter of time before other major notebook vendors start following Compaq's lead, increasing notebook versatility without increasing weight.



Benchmark Tests: Compaq LTE Elite 4/75CX

Across the board, test scores for the Compaq LTE Elite 4/75CX were in line with those of other notebook computers powered by DX4/75 processors.

The standout was the Graphics WinMark score, which was just below the best we've seen for a portable system. Here we compare test results against the average scores calculated

for all DX4/75 notebooks tested at PC Magazine Labs to date.

We used PC Magazine Labs' PC Bench 8.0; WinBench 4.0; and Winstone 94, Version 1.0, to measure performance of the Compaq LTE Elite 4/75CX. Higher scores represent better performance.

	Winstone (score)	Processor (score)	Graphics WinMark (millions of pixels per second)	DOS video (score)	Disk WinMark (score)	DOS disk (score)	DOSmark (score)	Battery Life (hours: minutes)
Compaq LTE Elite 4/75CX	39.6	31.1	6.5	3.497	770	929	508	3:26
DX4/75 notebook average	40.0	29.5	5.8	3.137	853	864	473	4:02

indicates a system's ability to perform Windows applications, was in line with scores garnered by other DX4/75 systems. The Elite, which uses nickel hydride cells, posted a Battery Life score of 3 hours 26 minutes with Hibernation turned off—slightly below average. With Hiber-

ation turned on, this showing was extended to more than 7 hours, making the Elite a full-day notebook.

Elite users have a wide range of display choices, from a dual-scan passive-color display to Compaq's superb active-matrix

► Compaq LTE Elite 4/75CX.

List price: \$5,999. Configuration: DX4/75, 8MB RAM, 340MB hard disk. Compaq Computer Corp., P.O. Box 692000, Houston, TX 77269-2000; 800-345-1518, 713-378-8820; fax, 713-378-1442.

Circle 430 on reader service card

Modems

The First V.34 Modems Take You Faster Than You've Ever Gone Before

BY WINN L. ROSCH

Bringing with it an uncompressed maximum data-transfer rate of 28,800 bits per second, V.34 has finally arrived. Was it worth the wait? We looked at the first V.34-compliant modems—Multi-Tech Systems' MultiModem II MT2834BA and U.S. Robotics' Courier V.34 Ready Fax—and found that each delivers all that V.34 has to offer but that the U.S. Robotics product goes a step further.

Both modems perform well and are compatible with the V.32 (9,600 bps), V.32bis (14,400 bps), and AT&T's V.32terbo (19,200 bps) specifications. The Courier adds support for Rockwell's V.FC (28,800 bps) standard. In addition, each modem includes Group 3 Class 2 fax support, V.42 error control, and V.42bis compression that boosts throughput to 115,200 bps.

During testing, each modem worked right out of the box. The two units were able to talk to each other at full V.34 rate without a hitch and passed binary files at better than 3,200 bytes per second using the Zmodem protocol. Both employ Hayes AT commands and include all the features expected in a modern modem, such as auto-answer, auto-dial, fallback/fall-forward, diagnostics, programmable profiles, dial-back security, and help screens. The biggest problem is that the V.34 specification is still in its infancy, so there are very few places to connect to. This is expected to change as V.34 becomes accepted as the data-transfer fast track.

Though the MultiModem II uses a straightforward implementation of the new AT&T

V.34 chip set, the Courier uses a Texas Instruments digital signal processor that gives it the flexibility to be a "V.Everything" modem. With firmware updates to its flash memory, it can be configured to any standard.

BELLS, WHISTLES, AND LIGHTS

Both modem makers show a keen appreciation of what you buy an external modem for: blinking lights. These external models have a dozen red LED indicators to let you monitor and troubleshoot your connections, but each manufacturer shows different information. The MultiModem II offers

individual indicators for 2,400-, 9,600-, 14,400-, 19,200-, and 28,800-bps operation. The Courier has one high-speed indi-



DATA FAST LANE: The U.S. Robotics Courier (right) and Multi-Tech MultiModem II (left) can both connect at 28,800 bps, but the Courier offers wider compatibility and is less expensive.

cator but shows more PC-to-modem data-exchange details.

The two modems take up

nearly identical amounts of desktop real estate: 1.4 by 6.2 by 9 inches (HWD) for the MultiModem II versus 1.3 by 6.4 by 10.3 inches for the Courier. The MultiModem II wears PC beige, the Courier stealth black. Either fits under a standard telephone.

As for price, the MultiModem II lists at \$799; it is \$849 with Multi-Tech's intelligent high-speed serial interface. U.S. Robotics sells the external Courier for \$595; an internal version lists for \$545. Another

\$200 adds compatibility with U.S. Robotics' proprietary HST (High-Speed Technology) protocol, which operates at 16,800 bps. Given these figures, the Courier has the lead, with lower cost and wider compatibility. Unlike standards, however, prices change quickly in the modem market; the best buy will depend on where and when you shop. Either of these modems will take you—quickly—into V.34 territory.

► **Courier V.34 Ready Fax.** List price: \$595 (\$795 with HST compatibility). Requires: Serial port (16550 UART or better recommended). U.S. Robotics Inc., 8100 North McCormick Blvd., Skokie, IL 60076-2999; 800-342-5877, 708-982-5010; fax, 708-982-5235.

Circle 425 on reader service card

► **MultiModem II MT2834BA.** List price: \$799 (\$849 with high-speed serial port). Requires: Serial port. Multi-Tech Systems Inc., 2205 Woodale Drive, Mounds View, MN 55112; 800-328-9717, 612-785-3500; fax, 612-785-9874.

Circle 426 on reader service card

...And One for Your Pocket

A handy little companion turns the Sharp OZ-9520 Wizard into a very convenient



SEND: Sharp's add-on modem transmits faxes or e-mail.

nient pocket communicator. The CE-FM4 Fax/Modem is a compact (0.7 by 1.7 by 3.5 inches, HWD) unit that attaches neatly onto the side of the Wizard. Once in place, the modem

lets you take advantage of the Wizard's built-in fax software—which includes an automatic cover sheet builder—to send faxes at 9,600 bps.

If you're adventurous, you might also try to send and receive e-mail at a slower 2,400 bps through the Wizard's terminal emulator. Although the terminal emulator works, it's arcane and badly in need of an overhaul.

Sold separately, the modem lists for \$149; it is, however, useless without the \$719.99 Wizard. Look for a Wizard/modem bundle, which, according to Sharp (800-237-2800), should be available on the street for about \$500. —*Tin Albano*

If you've ever owned a copy of Norton Utilities[®], you know you don't need a super-hero's cape to have magic-like powers.

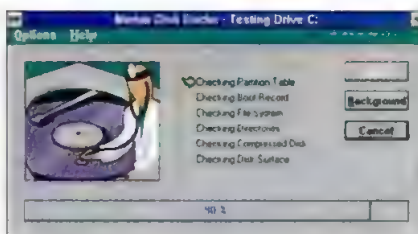
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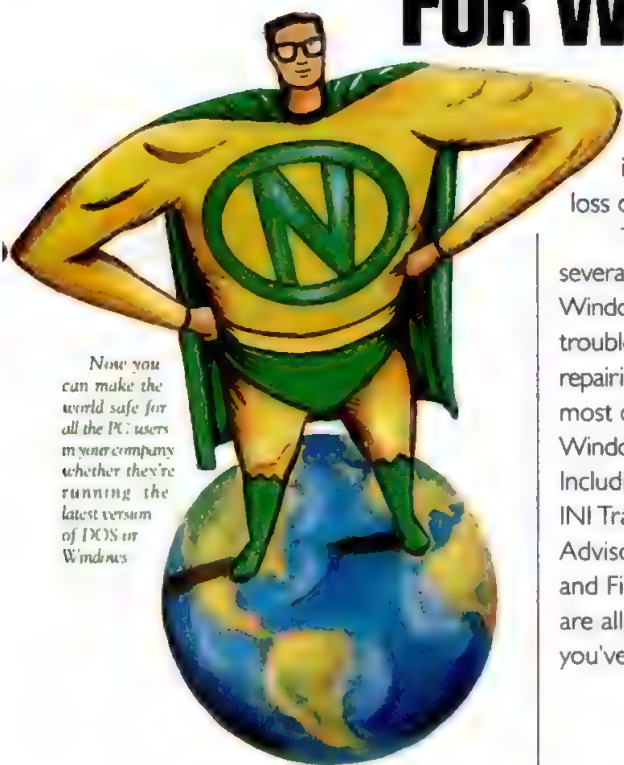


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Word Processing

Balancing Equations with EXP for Windows

BY BARRY SIMON

Rather than trying to make a square peg fit into a round hole by working with traditional word processors, those who frequently prepare scientific manuscripts get the best results with a full-fledged scientific word processor. These word processors can typically handle the intricacies of integrating complex symbols, graphs, and text, but they can be hard to learn. For users who need to do this, Brooks/Cole Publishing Co.'s EXP, Version 3.0—the first Windows-based scientific word processor—is welcome news. Despite the inconveniences of a new file format and several minor miscues, EXP excels in ease of use.

The key to success for any scientific word processing program is its ability to manipulate the array of symbols that are this specialty's stock and trade. Here, EXP marches to a different drummer than its competition. EXP instantly displays graphics, symbols, and type as you'd see them in the finished product; other competing products are non-WYSIWYG and can be complicated to use. EXP also supports TrueType fonts, ships with four typefaces of its own, and gives you access to several hundred symbols, which include Greek letters, arithmetic operators, and symbols denoting chemical elements.

SYMBOL BY SOUND

The standard paradigm for entering symbols in EXP is different from that used by its competitors, which rely on pull-down palettes that allow you to pick a symbol with a mouse click. For example, rather than navigating through several

menus and eventually clicking on the Greek letter alpha, you have a choice with EXP. Either use a variant of the traditional menu-driven method or just hit F4, type *alpha*, and then press Enter. The symbol dialog box includes 25 lists of symbols and their names; you can use this dialog box until you're familiar with the symbols' names. And abbreviations work, so you need type only *alp* to get the symbol for alpha.

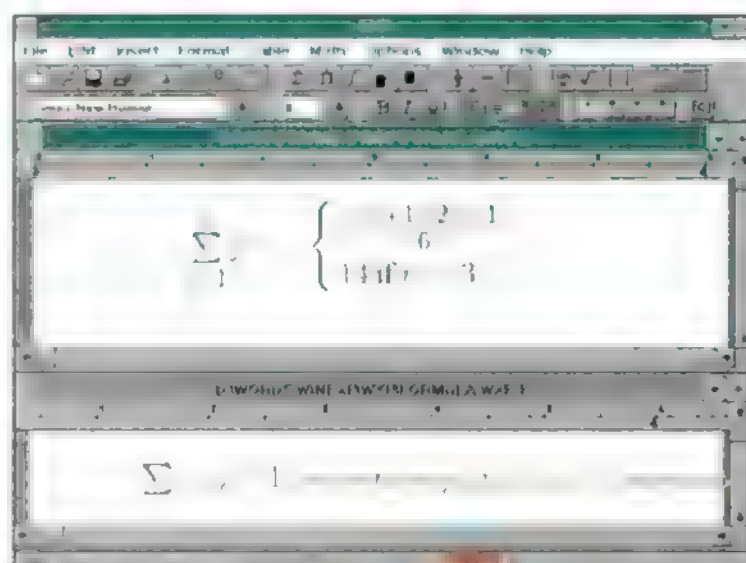
This transliteration technique generally works well but can be slightly confusing for beginners. For example, the negative symbol corresponds to typing *neg*, while the negate symbol corresponds to *negate*. Despite a steep learning curve, this technique soon turned out to be more intuitive and quicker than using the menus.

EXP also makes repetitive tasks easier with the program's Text Libraries. Any item or section that you plan to reuse can be added to the libraries, allowing that item to be called up and integrated into your document at the click of the mouse. Libraries can contain hundreds of entries and can be used with the Find and Replace commands. Because the libraries store elements in original typefaces and point sizes, however, the formatting needs to be adjusted when these elements are integrated into your document.

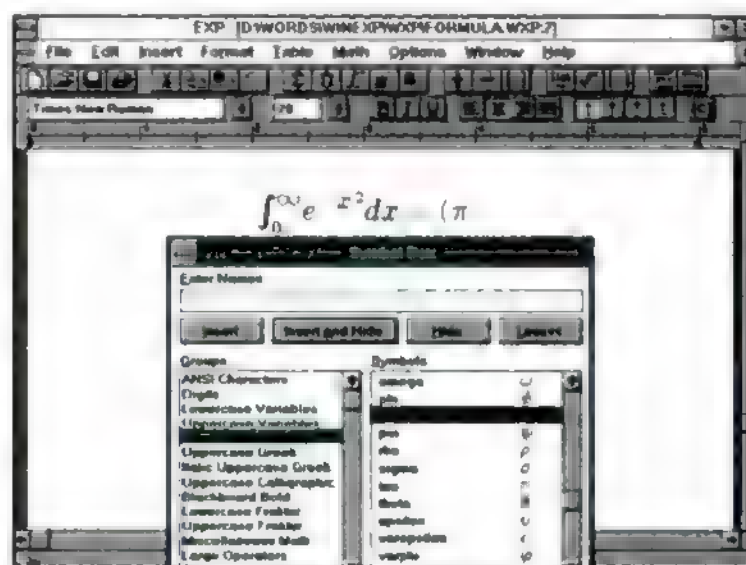
Like traditional word processors, EXP has a spell-checker, but the dictionary of scientific and medical terms is much deeper and even contains the names of

major scientists. So you can create mathematical expressions that are as accurate as possible, the program contains dozens of kinds of brackets and braces. There is even a special conditional equation, which allows you to follow an equal sign by a brace and several lines of definition.

Embedded graphics, such as charts, diagrams, and graphs, are supported via an array of built-in



VIEW: With EXP, you can quickly and easily build complicated equations, with or without codes showing.



SHORTCUT: Mathematical and engineering symbols can be entered either through the dialog box or by spelling them out.

import filters including .BMP, .CGM, .JPG, .TIFF, and .WMF, but not .WPG. You can embed PostScript files in Adobe Illustrator format and view and print them even without a PostScript printer. In this version of the program, OLE (Object

Linking and Embedding) is not supported.

HOW EXP STACKS UP

Compared with the competition, EXP is the only package to provide immediate WYSIWYG feedback for building complicated equations and is more natural to use than MathType and Expressionist, which operate as OLE servers for standalone word processors. The other alternative is TeX, a mark-up language that works from ASCII input and compiles the final equations. Until you run the TeX compiler and reviewer, you don't see correct line breaks, although formulas appear correctly.

On the downside, EXP uses its own file format, called .WXP. While you can import EXP for DOS files, there is no ability to export to TeX format. That feature, however, is high on the list of possible enhancements for Brooks/Cole. Another minor nuisance is the lack of indexing support, but the program does prepare footnotes and can automatically number diagrams, equations, or graphs.

EXP is an excellent way of preparing documents that are chock full of scientific formulas. Its WYSIWYG framework, TrueType support, rapid-entry shortcuts, and oodles of special symbols and brackets make it an attractive environment. EXP for Windows provides what many users will find is the best method of preparing scientific manuscripts on a PC.

► **EXP for Windows, Version 3.0.** List price: \$318.75; upgrade, \$99. Requires: 4MB RAM, 3MB hard disk space, Microsoft Windows 3.1. Brooks/Cole Publishing Co., 511 Forest Lodge Rd., Pacific Grove, CA 93950; 408-373-0728; fax, 408-375-6414.

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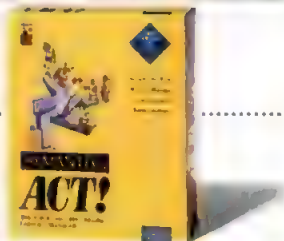
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■ Presentation Equipment Take Control of Your Presentations

BY SHERYL CANTER

If you make many presentations, you know that spontaneously annotating a slide can help hold your audience's attention. But when your presentation is computer-based, unplanned annotations require special equipment. The \$229 Mind Path Remote Control Model IR50-F/X, a wireless remote control that looks like those used for VCRs or TVs, lets you do spontaneous annotations and more—giving you control over the mouse and nearly 20 special effects.

The unit's infrared sensor plugs into a serial port and lets you control the computer from up to 45 feet away. You manipulate the mouse through a device called a MouseDisk, which lets you use your thumb to move the mouse in any of 16 directions. A button in the center of the disk serves as a left mouse button for clicking or double-clicking. Pressing down the center button locks it for drag-and-drop operations; press again to unlock it.

The remote control and the PC's mouse can be used simultaneously, which is convenient if you need to execute keyboard and mouse sequences that are too complex to store in the bundled software. Two slide-show buttons are set by default to move the presentation slides forward or backward, but they can be reassigned to any special effect.

The bundled Presentation F/X software—also sold separately for \$79.95—offers nearly 20 special effects, including a keystroke sender, a spotlight, a telestrator for screen annotation, a .WAV file player, and a zoom feature. The telestrator is most useful for circling or underlining; actual writing requires a pointing device with finer control than MouseDisk offers.

Five reassignable special-effects buttons on the remote control give you instant access to special effects; you could even set up an applause button. Button assignments can be changed on the fly through a pop-up special-effects menu. User profiles let you save button assignments and special-effects settings for use by different presenters. The special-effects software is Windows-only, but the remote



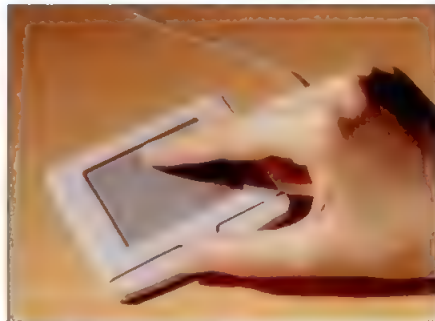
POINT AND SHOOT: Mind Path Remote Control lets you command your presentation as easily as if you were changing channels.

■ Pointing Devices

GlidePoint: Finger Navigation

BY BEN GOTTESMAN

Traveling executive's nightmare number 37: While you're finishing tomorrow's presentation on your flight home, your notebook's pointer locks in place, and no amount of playing with the trackball frees it. After you open the trackball to clean the actuator wheels, the ball slips



TOUCH: Cirque's GlidePoint pinpoints your finger's motion and translates it into pointer movements.

out of your fingers and rolls down the aisle. Suddenly, you're flying in coach and your ball is riding in first class. Cirque Corp.'s GlidePoint Portable, a unique nonmechanical pointing device, rules out such airline ball games and lets you sleep easy.

The flat GlidePoint Portable

(3.4 by 2.7 by 0.5 inches) represents the latest thinking in pointing devices. To control the pointer, just run your finger across or just above the unit's motion-sensitive surface. Clicking is accomplished by tapping one of the two mechanical buttons at the bottom of the unit or by tapping the GlidePoint's surface. Long, slow movements across the screen may require you to lift and reposition your finger. It takes a few minutes to become familiar with the GlidePoint and just a day or so to become truly comfortable.

The GlidePoint identifies and tracks the center of your finger by detecting changes in the electrical field above the unit's surface. There are no moving parts in the unit, so it is unlikely to stick the way most trackballs do. In more than a month of daily use, we had no significant problems.

The unit connects to a PS/2 mouse port via a 3-foot cable (there is no serial-port version) and can comfortably be used next

to the computer, above the computer's keyboard, or even in your opposite hand. The GlidePoint includes a 6-foot extension cable for desktop users.

This first commercial product from Cirque had some glitches. The pointer froze when a Toshiba Satellite T1900C laptop using the GlidePoint's drivers awoke from sleep mode. The resume function worked fine when we used the GlidePoint with Microsoft Mouse 9.0 drivers. Cirque says it will offer a Mouse 9.0-compatible driver by early fall.

While resembling the trackpad built into Apple's new 500 series of PowerBooks, the GlidePoint works on a different principle. The Apple device can track only your finger, and clicking still requires the use of mechanical buttons.

Cirque is working with computer vendors to incorporate the GlidePoint into future portable PCs. We hope they will. Portable users will quickly tire of using clumsy, breakdown-prone pointing devices when a more elegant solution is available.

► **GlidePoint Portable.** List price: \$99. Requires: PS/2 mouse port. Cirque Corp., 2850 East 3300 South, Salt Lake City, UT 84109; 800-454-3375, 801-467-1100.

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■ Diagramming

Inspiration: Idea Development Tool for the PC

BY LUISA SIMONE

Inspiration for Windows is a visual development tool that seeks to maximize your creativity. Technically, the \$295 Inspiration for Windows 4.0 is a graphics program—but with a limited graphics toolset, it will not excite artists. Inspiration more than makes up for this deficiency, however, with intuitive diagramming.

While in diagram view, you can choose symbols from among the 525 supplied or 100 user-defined offerings and insert them into a drawing using a flowchart, hierarchical, or cluster structure—or no particular order whatsoever. The ability to rearrange and dynamically link a collection of free associations and to develop relationships



From August 22 through August 26, you can go on-line to download a working model of Inspiration and discuss the product with Inspiration president Mona Helfgott and Ziff-Davis Interactive editor Cindy Bates. Type GO EXEC at any CompuServe prompt.

visually is Inspiration's main strength.

Other diagrammatic drawing programs, notably Micrografx's ABC Flowchart and ShapeWare's Visio, offer these same functions. But Inspiration's true role is as an idea development tool. For example, Inspiration's Rapid Fire mode lets you create new objects without removing your hands from the keyboard or interrupting your train of thought.

Like spreadsheets that let you annotate cells, Inspiration lets you attach notes to any symbol. Complex processes and deeper explorations of a problem are handled easily with child diagrams that reside in a subordinate window or are hidden

from view. While you're fiddling with the diagram, Inspiration maintains an outline in the background that surpasses even the most sophisticated presentation graphics program's ability to create an outline from free-form diagrams and update it as you change object relationships.

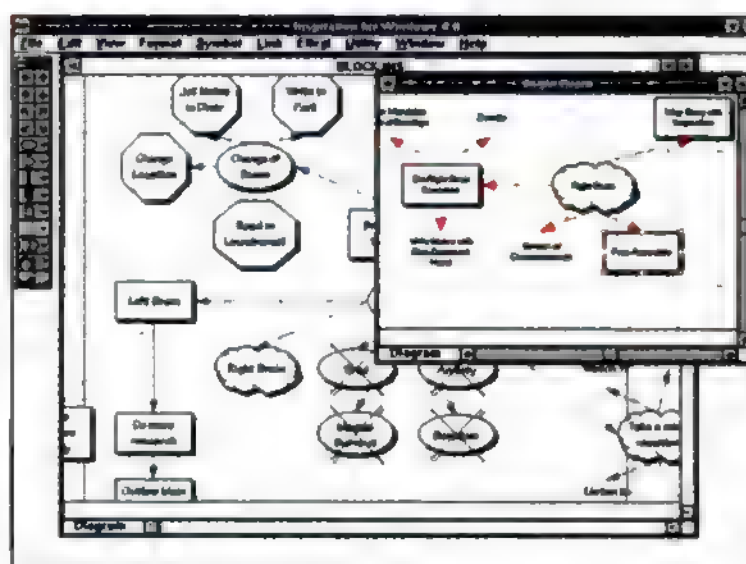
Inspiration should be a robust OLE server accessible from other applications—but it isn't. The only links to external programs are .BMP or .WMF exports. Inspiration should in-

clude tools for word associations, such as a thesaurus or a user-defined database of common ideas—but it doesn't.

Anyone who wants to break out of predictable thought patterns will find that Inspiration creates an atmosphere conducive to creative problem solving.

► **Inspiration for Windows 4.0.** List price: \$295 (\$129 through 1994). Requires: 386SX or higher, 4MB RAM, VGA graphics adapter, Microsoft Windows 3.1

or later. Inspiration Software Inc., 2920 SW Dolph Ct., #3, Portland, Oregon 97219; 503-245-9011; fax, 503-246-4292. Circle 424 on reader service card



LINK: Inspiration can handle complex nested diagrams; shown here is a child diagram attached to a symbol in the main window.

■ Applications Development

Connect the Dots with Capsule to Create Apps

BY SHERYL CANTER

Creating compound applications that combine the functions of spreadsheets, word processors, or other packages is an increasingly common aspect of today's workplace. Version 1.0 of Metaphor Inc.'s Capsule (\$199) combines the ease of a visual programming approach with the server features of OLE 2.0 to eliminate the need for scripting or macros, greatly simplifying the development process.

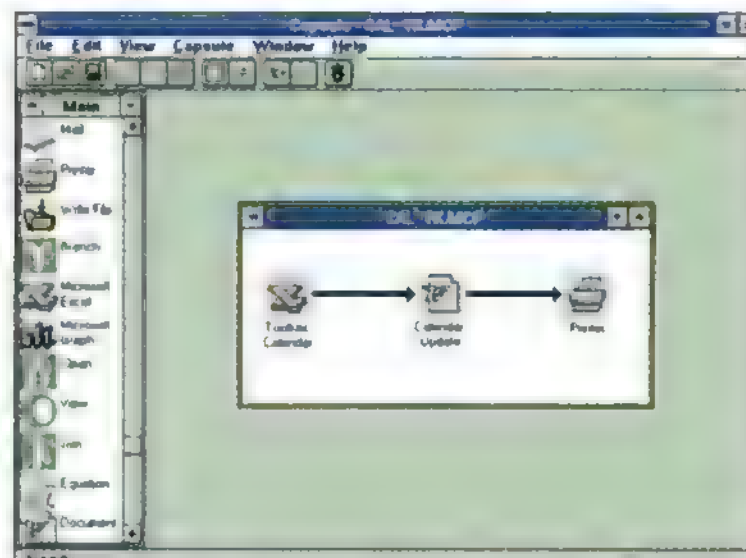
Capsule works with any OLE 2.0-enabled program and also supports a few older products that use DDE or OLE 1.0. All the major application suites and their applications are supported, including Microsoft Office and Lotus SmartSuite.

The Master Palette is the program's control center, showing all OLE 2.0-enabled applications as well as the components that are used to connect them, such as branch objects for conditional execution. To create a compound application—called a capsule—you just drag icons from the Main Palette or the

control component applications. On the other hand, Prodea-Synergy only allows single conditions to be tested at a time; Capsule lets you set up multi-way conditional branching. Cap-

sule's variable server also lets you choose meaningful names for variables; Prodea-Synergy limits you to one or two letters per name.

Capsule has minor problems: You must copy something into the capsule in order to print it, and Excel 4.0 doesn't automatically unload after a capsule using it has been



LINE OF SIGHT: Capsule creates applications by dragging components from the Master Palette to the capsule window and then connecting them with an arrow.

Windows File Manager to the capsule window. Establishing connections among components is as easy as drawing an arrow between them. Each arrow has a property sheet that describes the details of the connection.

Capsule's competition is ProdeaSynergy. (Version 1.1 was reviewed in our issue of February 8, 1994.) Version 2.0 of ProdeaSynergy relies on OLE 2.0—as does Capsule—but exploits the automation facility rather than server methods to

executed—the program must be reopened and then closed.

Capsule's greatest strength is its simplicity and its ability to create complex applications.

► **Capsule, Version 1.0.** List price: \$199 (\$99 through 1994). Requires: 386 or higher, 6MB RAM, 10MB hard disk space, Microsoft Windows 3.1 or later. Metaphor Inc., 1965 Charleston Rd., Mountain View, CA 94043; 800-399-5111, 415-961-3600; fax, 415-961-0596.

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■ Data Storage

Kingston's Data Traveler: A Hard Disk to Go

BY BRIAN NADEL

Large databases, graphics images, and multimedia presentations can easily stretch a notebook's hard disk to the breaking point. Although most new notebooks come with at least 200MB hard disks, those with older portable PCs have to get by with increasingly cramped quarters for our growing data demands. Enter Kingston Technology Corp.'s battery-powered external hard disk, The Data Traveler, available in 127MB and 209MB units. Each weighs only 2 pounds 4 ounces and can make just about any data portable.

While parallel-port, portable data-storage systems from SyDOS and Iomega use removable media that attach to separate base stations containing the battery and read/write heads, The Data Traveler uses an entire 2.5-inch Winchester hard disk that slides into the system's battery pack. The result is a device about the size of two VHS tapes (2.5 by 7.5 by 3 inches). That's slightly larger than the SyDOS ProNote, but it has three times the storage capacity.

Installation of the required drivers is quick and easy. Including the formatting of the disk, the entire operation takes only about 10 minutes. Some unexpected features include a pass-through device with two outlets, which keeps the parallel port active for printing, though you can connect to only one printer. Disk drives can also be hot-swapped for greater flexibility.

On the other hand, two shortcomings mar an otherwise impressive design: You can't lock the disk into place, and the unit's AC adapter is huge by today's notebook standards.

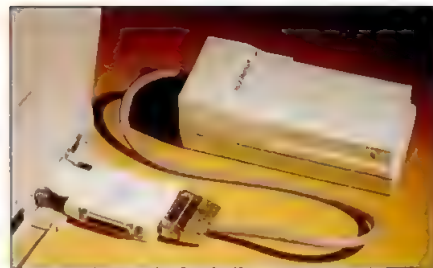
In informal testing using an IBM ThinkPad 755C, The Data Traveler worked with excellent

fidelity, neither losing data nor failing to produce files. The unit loaded Microsoft Excel 5.0 and Microsoft Windows 3.11 in 6 seconds and 20 seconds, respectively—more than adequate for most mainstream users but taking about a third longer than the system's native hard disk. The Data Traveler's nickel cadmium battery was able to dole out files

for about 3 hours.

Price is where The Data Traveler sets the pace. At \$565 for a 127MB drive and \$645 for a 209MB drive, storage costs \$4.45 per megabyte and \$3.08 per megabyte, respectively. This is about half the cost of competitive systems, making The Data Traveler an inexpensive method for taking large files on the road.

► **The Data Traveler.** List price: 127MB, \$565; 209MB, \$645. Requires: DOS 5.0 or later.



TAKE-OUT DATA: The Data Traveler's Winchester hard disk slides in and out of the battery pack.

Kingston Technology Corp., 17600 Newhope St., Fountain Valley, CA 92708; 714-435-2600; fax, 714-435-2699.

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■ Word Processing Add-On

Indexicon Indexes Documents Quickly

BY DAVID HASKINS

Indexicon for WordPerfect for Windows 6.0, Version 1.0 (\$149.99), is a smart but still-evolving word processor add-on that makes creating indexes simple. This capability makes long business documents more useful and saves time and money for those creating opuses.

Indexicon's installation process adds a toolbar button and menu option to WordPerfect for Windows (a version for Microsoft Word for Windows should be released by the time you read this). Creating an index of a loaded document is quick and easy: Click on the button and tell Indexicon how detailed you want your index to be. Indexicon can create indexes with as many as six levels of detail.

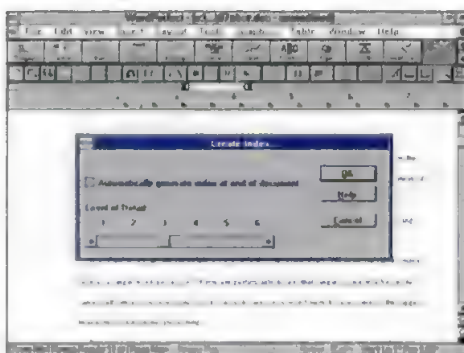
The program generates an index by using its 55,000-word dictionary and extensive set of rules for determining parts of speech and key concepts to analyze each sentence and determine the most important words and phrases. Indexicon's speed is impressive, particularly when compared with professional indexers, who typically index between three and six pages per hour. On a 33-MHz 486 with 16MB of RAM, Indexicon created an index for a 50-page, sin-

gle-spaced document to three levels of detail in 6 minutes 30 seconds.

While the result is generally an accurate and thorough index, it requires polishing. For

to give the user greater control over how strictly Indexicon applies its rules. The program also needs a feature to create custom lists of words for indexing. If you use specialized lan-

guage, you must index those words manually. Iconovex promises both features in forthcoming releases. But the biggest problem is that Indexicon can index only the currently loaded document. If each chapter in a manuscript is a separate file, you must gang all the files togeth-



DETAILS: Indexicon lets you decide how many levels of detail you want in your indexes.

example, Indexicon created an entry for *feeder* with a subentry for *sheet* when *sheet feeder* should have been a subentry under the broader topic *scanner*. Also, Indexicon indexed only half the references to the word *microcomputer* in the test document, deeming the rest superfluous. This is a subjective call even for professional indexers, and Indexicon was usually but not always correct. But even with manual cleanup, Indexicon took a fraction of the time and cost of professional indexing.

Some fine-tuning is needed

er prior to indexing.

Even with these shortcomings, Indexicon's indexes can add value to business documents and save time and money for authors on a tight budget.

► **Indexicon for WordPerfect for Windows 6.0, Version 1.0.** List price: \$149.99. Requires: 8MB RAM, 6MB hard disk space, Microsoft Windows 3.1 or later, WordPerfect for Windows 6.0 or later. Iconovex Corp., 7448 W. 78th St., Bloomington, MN 55439; 800-943-0292, 612-943-0292; fax, 612-943-1087.

Circle 422 on reader service card

A collage of computer hardware. At the top, an Intel Pentium processor is shown on a circuit board. To the right is a beige mouse. Below the mouse is a white system unit with a 'ZEOS' label. In the foreground, a beige keyboard is visible with keys like 'Z', 'A', 'S', 'W', '1', '2', '3', '4', '5', '6', '7', '8', '9', '0', 'F1', 'F2', 'F3', 'F4', 'F5', 'F6', 'F7', 'F8', 'F9', 'F10', 'F11', 'F12', 'DEL', 'INS', 'DEL', 'F13', 'F14', 'F15', 'F16', 'F17', 'F18', 'F19', 'F20', 'F21', 'F22', 'F23', 'F24', 'F25', 'F26', 'F27', 'F28', 'F29', 'F30', 'F31', 'F32', 'F33', 'F34', 'F35', 'F36', 'F37', 'F38', 'F39', 'F40', 'F41', 'F42', 'F43', 'F44', 'F45', 'F46', 'F47', 'F48', 'F49', 'F50', 'F51', 'F52', 'F53', 'F54', 'F55', 'F56', 'F57', 'F58', 'F59', 'F60', 'F61', 'F62', 'F63', 'F64', 'F65', 'F66', 'F67', 'F68', 'F69', 'F70', 'F71', 'F72', 'F73', 'F74', 'F75', 'F76', 'F77', 'F78', 'F79', 'F80', 'F81', 'F82', 'F83', 'F84', 'F85', 'F86', 'F87', 'F88', 'F89', 'F90', 'F91', 'F92', 'F93', 'F94', 'F95', 'F96', 'F97', 'F98', 'F99', 'F100'.

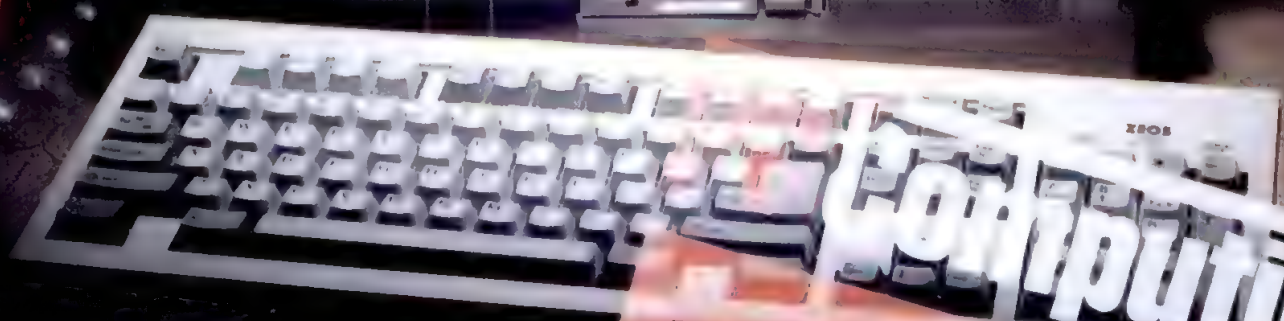
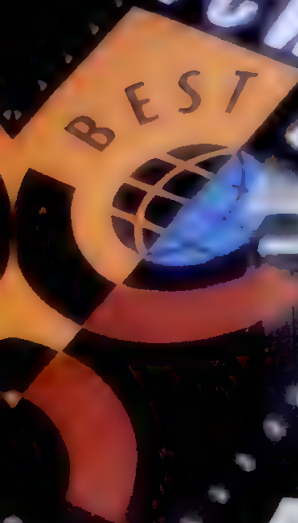
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PENTIUM-66	\$2095 Lease \$76/mo.	\$2395 Lease \$87/mo.	\$2895 Lease \$105/mo.	\$3445 Lease \$114/mo.
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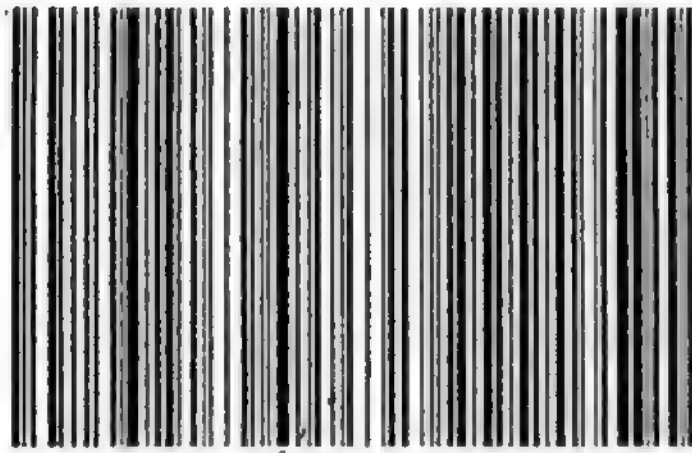
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April 1994
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March 1994
486DX2-66
June 1994
486DX2-66
June 1994
Pentium-66
July 1994
Pentium-66
August 1994
Pentium-66
August 1994
Pentium-90



May 1994
Pentium-66



June 1994
Pentium-66
August 1994
Pentium-90



March 1994
486DX2-66

ZEOS DESIGNED PANTERA

ZEOS has earned an unparalleled ten awards for its Pentium processor-based Pantera. These top awards from leading computer experts mean one thing—the ZEOS Pantera is your #1 Pentium processor-based system.

Numerous companies offer Pentium processor-based systems. So what makes the ZEOS system the consistent winner—review after review?

The ZEOS Pantera is a completely original design—from start to finish. Many competitors use the same cookie-cutter motherboard, drop in a few service parts, add their name, and then claim to have a good computer.

Not at ZEOS. We start with a ZEOS designed motherboard, one that is created specifically to take full advantage of the latest technological advancements employed in each system. The Pantera motherboard is stocked with exceptional features such as a hot new ZEOS designed, on-board PCI Local Bus IDE Controller that, as *PC Magazine* said, “pushes disk access into new territory.” The PCI Controller allows up to four IDE devices to be connected directly to the system's PCI bus, enabling you to experience faster performance and greater flexibility.

For further performance breakthroughs we've included a new 64-bit PCI video controller for super-fast Windows-acceleration.

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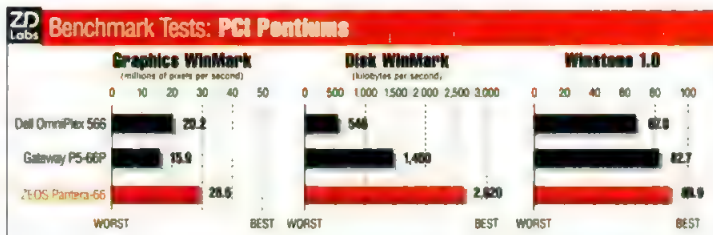
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- SVGA color monitor
- DOS, Windows for Workgroups, Microsoft Mouse



Pantera
486DX-33
\$1945
486DX-66
\$2045

PACKAGE #2:

- 8MB RAM
- 528MB local bus IDE hard drive, 256K cache
- 2X CD-ROM drive, 3.5" 1.44MB floppy drive
- PCI local bus SVGA video
- SVGA color monitor
- DOS, Windows for Workgroups, Microsoft Mouse



Pantera
486DX-66
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- DOS, Windows for Workgroups, Microsoft Mouse
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EDITORS' 100:

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- 2X CD-ROM drive, 3.5" 1.44MB floppy drive
- Diamond Stealth 64/PCI local bus graphics with 2MB RAM
- 14" SVGA color monitor
- DOS, Windows for Workgroups, Microsoft Mouse
- Choice of Lotus Windows application



Pantera
Pentium-66
\$3095
Pentium-90
\$3395

EDITORS' CHOICE:

- 16MB RAM, 256K SRAM cache
- 528MB local bus IDE hard drive, 256K cache
- 2X CD-ROM drive, 3.5" 1.44MB floppy drive
- Diamond Stealth 64/PCI local bus graphics with 2MB RAM
- 15" SVGA color monitor
- 10-bay vertical case
- DOS, Windows for Workgroups, Microsoft Mouse
- Choice of Lotus Windows application



Pantera
Pentium-66
\$3638
Pentium-90
\$3938

BEST MM:

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- 528MB local bus IDE hard drive, 256K cache
- 2X CD-ROM drive, 3.5" 1.44MB floppy drive
- 16-bit sound card, stereo speakers
- Diamond Stealth 64/PCI local bus graphics with 2MB RAM
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- 10-bay vertical case
- DOS, Windows for Workgroups, Microsoft Mouse
- Choice of Lotus Windows application



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486SL-25
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CIRCLE 155 ON READER SERVICE CARD

■ Fonts

Two Font Editors to Create and Customize Typefaces

BY EDWARD MENDELSON

Until now, if you wanted the flexibility of modifying an existing typeface or creating a new one, you had two choices: Use the current Macintosh version of Altsys Corp.'s Fontographer 3.5, or use the Windows version, which is now one generation behind. Two new Windows-based font editors—SoftUnion's \$349 FontLab for Windows, and DS Design's \$119 Type-Designer 2.5—give Fontographer its first serious competition.

Like other commercially available font editors, FontLab and Type-Designer use the PostScript Type 1 format as their native format. Both packages can import and export TrueType fonts, but while FontLab is a total font-design tool, Type-Designer is the best tool for converting Type 1 to TrueType fonts.

FontLab: Total Control

FontLab combines dazzling editing and automation features with a uniquely responsive interface. It is simple enough that beginners can modify existing fonts with special effects like shadows and perspective or import logos or special characters. But it also lets experts manipulate advanced typeface features that are otherwise accessible only on the workstation software.

FontLab lets you work more intuitively than any other font editor by giving you the ability to put the cursor at any point on the curve or line and push or pull

until you create the shape you want. Like other font editors, FontLab works best with a drawing tablet; unlike Fontographer, however, it doesn't respond to lighter or heavier strokes from a pressure-sensitive tablet.

To create a typeface from a drawing, handwriting, or large-size printed text, FontLab offers a unique program that converts a scanned image into a rough ver-



CONTROL: FontLab's controls include well-designed tools for modifying characters and keeping track of changes.

sion of a font that requires cleaning up around the edges and the addition of *hints* (instructions that improve output at low resolution and small sizes) and kerning data. The program has the unique ability to generate kern pairs automatically, although its automated output frequently needs further refinement.

The main elements of FontLab's screen are editing windows, which display outlines and control points, and preview windows, which show characters as they would print. FontLab lets you display multiple characters at once, but, unlike Fontographer, it won't let you keep more than one font open at the same time. Dialog boxes let you modify every documented feature of the Type 1 font format, and a unique editing window provides you

with access to the undocumented PostScript code found in many Adobe typefaces.

Almost every FontLab menu includes a button that tells the program to optimize any feature controlled by that menu. For example, one button automatically fills in the various font and family names that can be included in a font. Another button automatically assigns consistent widths to thick and thin lines.

Among FontLab's other advanced functions is the ability to morph two versions of the same character so that you can choose from intermediate versions generated by the program.

Nothing approaches the control that FontLab provides over every element of type design.

Type-Designer: Font Converter

Compared with FontLab, Type-Designer offers a rela-

other font editors and utilities export a Type 1 font in TrueType format, they strip off all custom hints created by the original designer and create generic hints instead. The resulting font looks clumsy on-screen and misshapen on the page. Type-Designer, in contrast, translates Type 1 hints into the corresponding TrueType hints for superior output at all sizes and resolutions.

For creating or modifying fonts, Type-Designer includes a simple set of tools for drawing lines and curves but no palette of standard shapes as in FontLab. A useful preview window displays the current character in multiple sizes; you can add hints in a more intuitive way than with other font editors. A separate window lets you adjust kerning. You can view one character while editing another, but you can't display more than two characters at once, and, unfortunately, you can work with only one font at a time.

The program's unique conversions compensate for its limitations. If you've been disappointed by other font converters, you'll probably be delighted by Type-Designer.



PREVIEW: Type-Designer displays samples of a character in multiple sizes.

tively limited set of drawing tools, but it more than makes up for that with accurate conversions from Type 1 format to Windows' native TrueType format. If faithful conversions are your interest, this is the package to buy.

The trick is that when all

► **FontLab for Windows.** List price: \$349. Requires: Microsoft Windows 3.0 or later. SoftUnion (distributed by Pyrus North America), Box 465, Millersville, MD 21108; 800-435-1960, 410-987-5616; fax, 410-987-4980.

Circle 432 on reader service card

► **Type-Designer 2.5.** List price: \$119. Requires: 4MB RAM, 1MB hard disk space, Microsoft Windows 3.1. DS Design, 2440 SW Cary Pkwy., #210, Cary, NC 27513; 800-745-4037, 919-319-1770; fax, 919-460-5983.

Circle 433 on reader service card

Windows Utilities

Grammatik 6.0 Misses as Many Errors as It Finds

BY RUBIN RABINOVITZ

Grammatik, the top program in *PC Magazine's* last roundup of grammar checkers (May 25, 1993), has gotten slightly better, with an improved ability to make your writing more precise. But it still catches fewer than half of all errors in a piece of writing, making it far from a fail-safe tool.

Using an enhanced root-word-based sentence-analysis engine, Grammatik 6.0 was able to spot 39 percent of punctuation errors and 51 percent of grammar and style problems on our tests, giving it a 46 percent overall error-detection rate. This is slightly better than Grammatik 5.0, which caught 36 percent of the

punctuation errors and 46 percent of the grammatical and stylistic errors, for an overall error-detection rate of 42 percent.

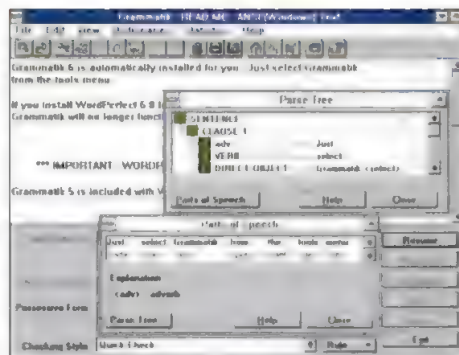
These gains are accompanied by an improved hits-to-false-flags ratio, which measures how often the program suggests a valid correction versus how often it suggests an improper change. Grammatik 6.0 had a ratio of 9.7:1; Version 5.0's ratio was 8.1:1.

Grammatik's latest version improves performance and adds a rewriting feature that previews corrected versions of sentences, and a Parse Tree, which lets you diagram sentences and break them into their parts of speech. The program includes ten style guides and three levels of formal-

ity, to adjust the proofing process to the most appropriate style of writing. Grammatik's QuickCheck utility notes the errors you make most often and provides statistics on your document's readability.

Available only in a Windows version, Grammatik 6.0 can be launched from within the most popular Windows word processors and can import documents from many DOS word processors, as well as documents created in ASCII, ANSI, and RTF formats.

As welcome as its enhancements are, Grammatik still misses as many errors as it detects, a problem shared with other grammar-checking programs. Grammatik will definitely help you



PARTS OF SPEECH: Grammatik's utilities parse sentences, identifying the individual elements.

improve your writing; but if a bulletproof document is what you're after, you'll need the help of a skilled human editor.

► **Grammatik 6.0 for Windows.** List price: \$49.95. Requires: 2MB RAM, 2.5MB hard disk space, Microsoft Windows 3.1 or later. WordPerfect Corp., 1555 N. Technology Way, Orem, UT 84057-2399; 800-451-5151.

Circle 402 on reader service card

Cross-Platform Utilities

Conversions Plus 2.5 Extends Its PC-to-Mac Lead

BY J. W. OLSEN

In the past, if you wanted to cross the border between PCs and Macintoshes, you had two choices: a DOS product with device drivers that treat PC floppy disk drives as virtual Macintosh drives or a Microsoft Windows application that also reads Mac disks. Conversions Plus, Version 2.5 (\$149), from DataViz, combines both capabilities to translate files accurately between the two worlds.

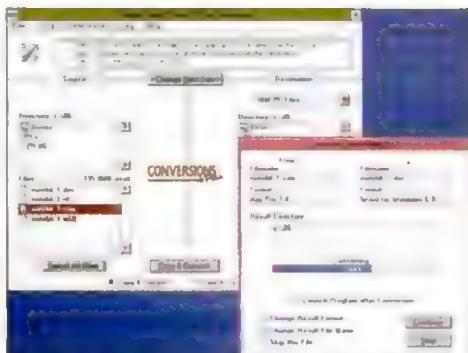
What sets Conversions Plus apart from competitors is its excellent and complete file-format translation. Where other products essentially transfer only files, ignoring format incompatibilities, Conversions Plus maintains file formatting. Version 2.5 supports the

latest releases of popular word processors and spreadsheet and database formats, and offers some degree of support for graphics embedded within word processor documents, including .BMP, .WMF, and .WPG formats for PCs, plus Pict and Pict2 for Macs. It also supports OLE objects within Excel, Microsoft Word, and Works for Windows

documents.

On the downside, software-only PC/Mac conversion products such as Conversions Plus support 1.44MB PC drives and high-density Mac disks but not lower-density Mac disks.

Conversions Plus now translates between popular PC formats as well. You can, for example, convert a file from WordPerfect to Word for Windows or from Excel to Quattro Pro. Translation combinations are not as extensive as in products that do exclusively PC-to-PC translations—such as Tool-



PC-TO-PC TOO: Conversions Plus augments PC-to-Mac file translation with the ability to convert between popular PC file formats.

Works' Word for Word/Professional—but Conversions Plus's translation quality is excellent.

Hypro Technologies' MacAccess, a DOS device driver that creates virtual Mac drives accessible from any DOS or Windows program (including the File Manager), is the key. After you load this driver, your 1.44MB drive takes on a split personality, acting as either a PC drive or a Mac drive, depending on the

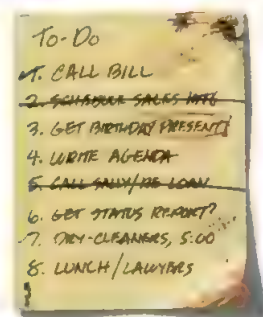
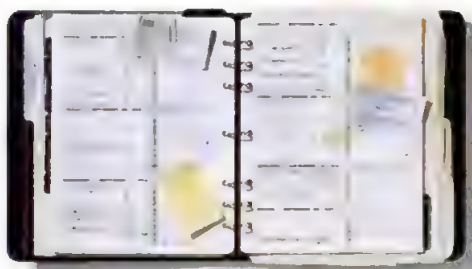
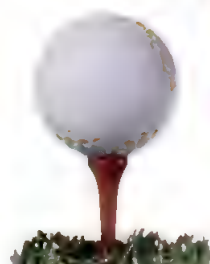
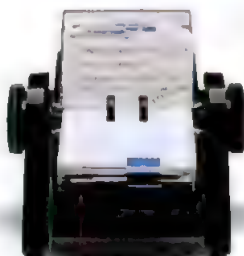
drive letter used. For instance, you'd use drive A: for disks containing DOS or Windows files and drive E: for disks containing Mac files.

Setting up this module could be easier; you need to load two device drivers from the DOS prompt via a special loader. Unfortunately, the manual provides an erroneous filename for this loader. And although the drivers occupy a bearable 68K of system memory, poor memory allocation reduces space for other executables by a whopping 144K. Also, there were conflicts between the MacAccess module and common resident antivirus programs.

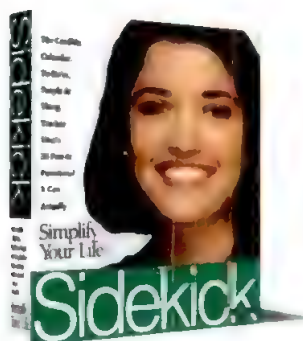
Despite these difficulties, powerfully expanded translating powers keep Conversions Plus comfortably ahead of the pack.

► **Conversions Plus, Version 2.5.** List price: \$149; upgrade, \$39.95. Requires: 3MB RAM, 6MB hard disk space, Microsoft Windows 3.1 or later. DataViz, 55 Corporate Dr., Trumbull, CT 06611; 800-733-0030, 203-268-0030; fax, 203-268-4345.

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Customer Management

Complaints Desk Handles Customer Gripes

BY J. W. OLSEN

Everyone has gripes. So now we have Spectrum Technologies' Complaints Desk for Windows 1.0 to help log, quantify, and respond to inquiries from complaining customers. The Microsoft Windows version reviewed here ships for \$179; a DOS version lists for \$129. Success with Complaints Desk depends upon careful tailoring of the product to your company's structure and needs.

The key step is designing up to five hierarchical levels of anticipated complaints (Code No. 1 through Code No. 5). Your top level might comprise a list of departments; your next level, categories of products or services within each department. The third level could detail individual products or services; a fourth level, topics such as reliability and functionality. The final level subdivides topics by specific issues. A Department Code designates corporate units to follow-up.

When a call arrives, you enter the contact information (or select it from the existing database) and identify the problem in your hierarchical categories. At this point, you can pop up a prepared script for the selected complaint with anticipated questions and approved responses. Free-form comments can be entered, and you can generate form letters with the included word processor module. Though word processing files saved in Rich Text Format are accessible, Complaints Desk regrettably doesn't exploit OLE to link or embed external documents.

Popular LANs are supported, with protection at the database and record levels. User access can be limited to add-only; add-and-query; or add,

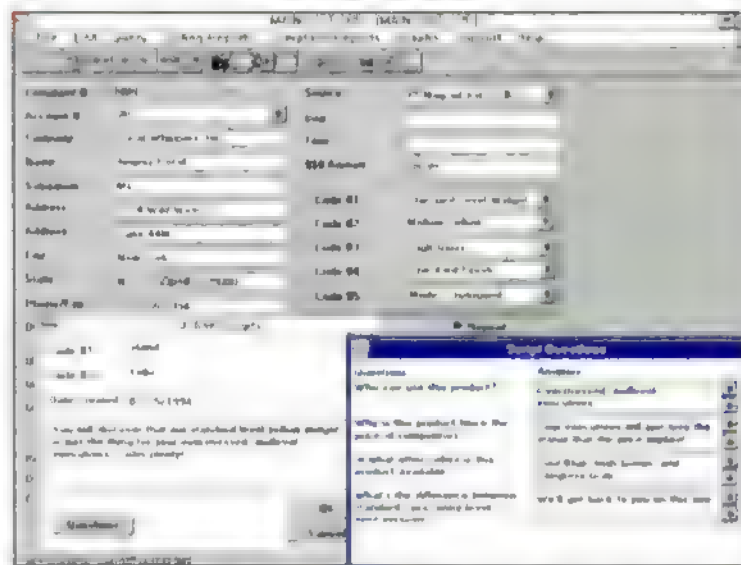
query, and modify. Employing the Paradox database engine, Complaints Desk offers versatile querying to retrieve records for action. It includes more than 20 preprogrammed reports, charts, and graphs. On our tests, Complaints Desk ran sprightly on a 486SX/33 with 8MB of system memory.

One of this product's drawbacks is that you can't assign meaningful names to field labels, other than code numbers. We also encountered a bug after

attempting to open a mistyped database name: Complaints Desk refused access to valid databases until we restarted the program.

On the whole, Complaints Desk is a winner for small companies looking for an inexpensive, flexible approach to handling complaint calls and inquiries.

► **Complaints Desk for Windows 1.0.** List price: \$179. Requires: 4MB RAM, 10MB hard disk space, Windows 3.1 or later. Spectrum Computer



INSTANT ANSWERS: Standardizing customer service responses to frequently asked questions is easy with Complaints Desk.

Technologies, 2150 Liberty Dr., Niagara Falls, NY 14304; 800-879-3225, 716-283-0825; fax, 716-283-0828.

Circle 437 on reader service card

Fonts

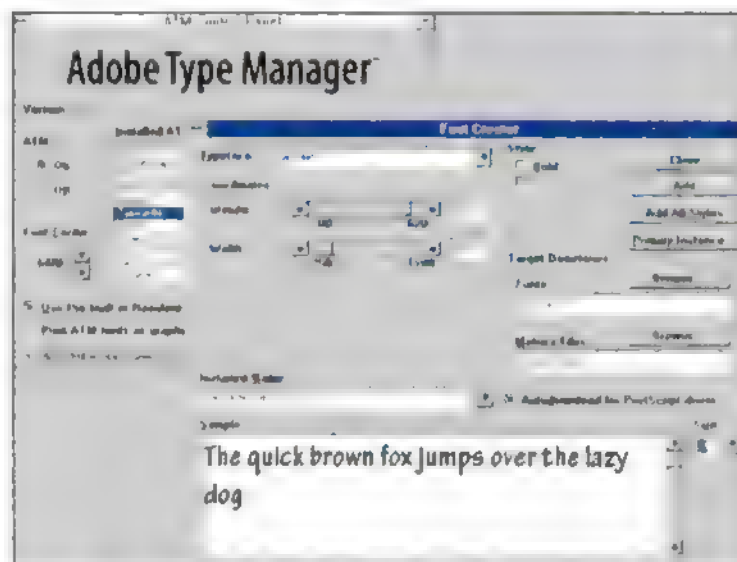
Adobe Type Manager 3.0: More Fonts for Less

BY EDWARD MENDELSON

In designing Adobe Type Manager 3.0, Adobe Systems went beyond a mere speed increase. ATM 3.0 offers 30 fonts—more than twice the number offered by the previous version—as well as new typographic and network features. Adobe has also lowered the price to \$60 (the upgrade is \$29) and now includes a copy of ATM in all its typeface packages.

The most significant feature of Adobe's Microsoft Windows-based font scaler is its networking capability. Now, any font installed on a shared drive is available to all clients that have access to the drive. But the most spectacular typographic feature is support for Multiple Master typefaces, which were previously available only on the Macintosh platform. Multiple Master fonts can be squeezed or expanded or made darker or lighter while retaining the subtlety and balance of their design.

Only one of the fonts now included with ATM is a Multiple Master: a version of the popular Tekton typeface, which is based on an architect's handwriting. You can use sliders in ATM's Create menu to customize



CHANGE: Adobe Type Manager 3.0 allows you to customize fonts by manipulating Multiple Master typefaces.

Tekton by varying the font's darkness and width. Each new version adds two small files to your hard disk—one about 3K in size, the other about 200 bytes.

One advantage of Multiple Masters is that you can create a font that exactly fills a space with characters. At the moment,

you can achieve this only by trial and error.

Adobe has released nine other Multiple Master typefaces, and more are on the way. Some include adjustments that alter the shape of the font for better appearance at large or small sizes. This optical compensation was an essential feature of the design of all metal typefaces; Adobe's Multiple Masters offer the first practical implementation of the feature in digital type. Multiple Masters are available only in Type 1 format, which requires Adobe Type Manager. The TrueType format supports Multiple Master features, but no TrueType font that incorporates the features has been released.

In sum, Adobe Type Manager 3.0 is an essential upgrade for everyone who uses type.

► **Adobe Type Manager 3.0.** List price: \$60; upgrade, \$29. Requires: 2MB RAM (4MB recommended), 1MB hard disk space, Windows 3.1 or later. Adobe Systems Inc., 1585 Charleston Road, P.O. Box 9700, Mountain View, CA 94039; 800-833-6687, 415-961-4400; fax, 415-961-3769.

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CIRCLE 032 ON READER SERVICE CARD

■ Portable PCs

A More Powerful OmniBook

BY CHRISTOPHER BARR

Hewlett-Packard Co.'s \$1,799 HP OmniBook 530 is the fourth entry in the OmniBook line. This 2.9-pound subnotebook offers a 33-MHz processor, more powerful graphics, and other improvements over its predecessor that place it roughly on a par with other subnotebooks.

The one notable exception: The system's screen doesn't measure up to the competition. The OmniBook 530 has a reflective (not backlit) monochrome LCD panel that can be difficult to read in low light.

The heart of Hewlett-Packard's update is the 33-MHz Intel 486/SX CPU. On PC Labs' benchmark tests, this unit was more than 2.5 times as powerful as the previous Cyrix Cx486-based OmniBook. Bolstered by a new graphics chip and external VGA adapter, the OmniBook 530's graphics performance has improved dramatically.

Storage is handled by a 130MB PCMCIA hard disk. Unlike the original OmniBook, which incorporated the operating system, Microsoft Word, and Microsoft Excel on a ROM card,

the OmniBook 530 has DOS and Microsoft Windows preinstalled on its hard disk.

The OmniBook 530 has other new features: Minimum RAM has been boosted to 4MB, and system memory can be expanded to 16MB. New versions of PCMCIA-card and socket-services software make the four



PALM-POWER: Hewlett-Packard's OmniBook 530 is a competitive subnotebook with an Intel 486SX/33 CPU.

PCMCIA slots more accessible.

Despite its poor-quality display, the OmniBook 530's pop-out mouse, full-size keyboard, four PCMCIA sockets, and dedicated modem socket classify it as a stellar bantamweight.

► **HP OmniBook 530.** List price: \$1,799 with 4MB RAM, 130MB hard disk. Hewlett-Packard Co., 1000 NE Circle Blvd., Corvallis, OR 97330; 800-443-1254, 503-757-2004; fax, 503-715-5488.

Circle 427 on reader service card

■ Telephony

Modem-Ready Headset: Hands-Free Connections

BY MARK BROWNSTEIN

Plantronics' CompuSet MH-07 Modem Headset is designed around the simple idea of using your PC's modem and communication program to dial the telephone, and then using the headset to communicate. While there are advantages to using software to dial and track your phone calls, the \$99.95 headset falls short of the mark in terms of convenience.

It's easy to set up the CompuSet: Plug the phone line into a line splitter, and then connect the modem to one jack and the head-

set to the other. The one-piece headset hangs comfortably from the ear, providing a hands-free alternative to a heavy handset or a speakerphone.

Although the CompuSet is a good first effort, its biggest design flaw is its reliance on the modem to dial. Since there is no keypad, software is the only way to make a connection. This shortcoming is apparent if your



PHONE HOME: Plantronics' one-piece CompuSet headset connects via your PC's modem for hands-free phone calls.

call lands you in a digital queuing system: You have to turn the headset off (and have your modem dial your responses), pick up your desk phone to navigate digitally, or wait for a human operator.

The CompuSet is really an add-on for a connected PC user, not a replacement for the stand-alone telephone.

► **CompuSet MH-07 Modem Headset.** List price: \$99.95. Requires: Modem and phone line. Plantronics, 345 Encinal St., Santa Cruz, CA 95060; 800-544-4660, 408-426-5868.

Circle 428 on reader service card

■ Windows Utilities

Clear Out Old Files with Disk Historian

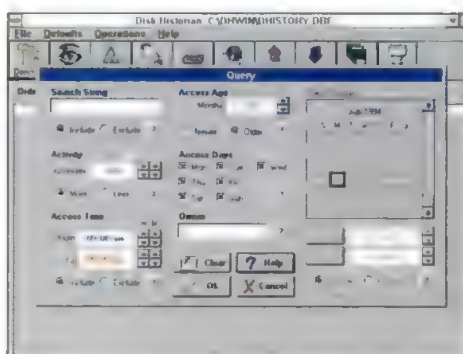
BY BRIAN NADEL

When trimming old, unused files from your PC, you want to cut enough to free up valuable disk space; but if you slice too deeply, you might regret your actions. Disk Historian 2.1 (\$79.95) is a powerful tool that keeps track of how often files are used to help you prune your hard disk.

The program creates a database of files that is updated with usage information every time you close Microsoft Windows.

The database is excellent for clearing out old files: You can use either Disk Historian's default criteria or your own parameters for determining which files are current. On our tests, Disk Historian identified nearly a megabyte of old files.

The program runs as a TSR that uses 13K of memory, and each file entry occupies 165 bytes of disk space. Because virus and backup programs periodically open and close files, Disk Historian must be removed when



PRUNE: Disk Historian's query mode allows you to choose your own parameters for a search or use the preset criteria.

these programs are used; an included batch file does this.

Disk Historian is a valuable

tool for reducing the information age's flotsam and jetsam.

► **Disk Historian 2.1.** List price: \$79.95 (\$59 until September 30, 1994). Requires: 4MB hard disk space, DOS 5.0 or later, Microsoft Windows 3.1 or later. Solid Oak Software Inc., P.O. Box 6826, Santa Barbara, CA 93160; 805-967-9853; fax, 805-967-1614.

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be. First of all, it's quite small. Only 7.5" wide, 10.25" high, and 1.5" deep. And you'll find it's also very light, a mere 3.5 lbs.

But most importantly, the Contura Aero is an incredibly full-featured and useful working tool. It comes with 4MB RAM, an 8" monochrome back-

lit VGA display, integrated trackball, preinstalled software and more.

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■ Personal Information Managers

ScanCard for Windows 1.0 Keeps It Simple

BY BARRY SIMON

While there are an endless number of PIMs useful for organizing highly structured information, the ways to organize unstructured and semi-structured information effectively are few and far between. One answer has been to eschew the computer for The Executive Gallery's ScanCard, which consists of a series of folders, each of which houses columns of staggered cards. Since these color-coded cards reveal their titles at the top, the system is ideal for scanning through to jog your memory about some neglected task or needed follow-up call. Now The Executive Gallery has released the \$149 ScanCard for Windows 1.0, which uses the

same metaphor and retains the product's simplicity.

In the program's main window, you can open one or more folders of cards. Each folder holds a pair of columns with pockets for eight cards each; of course, you can add additional pages to the folders. The card titles stick out of the pockets, so you can scan through them just as easily as in the non-PC version. Click on any card and the contents are revealed, enabling you to check details or update information.

ScanCard includes 20 color-coded card types, ranging from Travel Itinerary to Telephone Message to lined Note Cards. Any card can be assigned a due date and a follow-up date. If the follow-up date passes without

action, the card is tagged with a butterfly symbol. In addition, those folders that contain over-



WAKE-UP CALL: ScanCard lets you instantly scan 16 title cards to jog your memory about ongoing projects.

due cards show a bee symbol in their left corner.

The insect metaphor is a bit much, but except for a few kinks, the system works well enough. The most onerous of these kinks

is that searches are case-sensitive and based on card type, which means you can't perform a full-text search of all your notes. It would also be helpful if you could return an open card to its pouch with just a single click.

For users with lots of disparate, free-form data to organize and those with lots of tasks to track, ScanCard is an attractive first offering that complements The Executive Gallery's non-PC system.

► **ScanCard for Windows, Version 1.0.** List price: \$149. Requires: 2MB RAM, 1.5MB hard disk

space, Windows 3.1 or later. The Executive Gallery Inc., 814 W. Third Ave., Columbus, OH 43212; 800-848-2618; 614-421-3400; fax, 614-421-3422.

Circle 419 on reader service card

■ Applications Development

Visual Baler: First Step to Instant Spreadsheet Applications

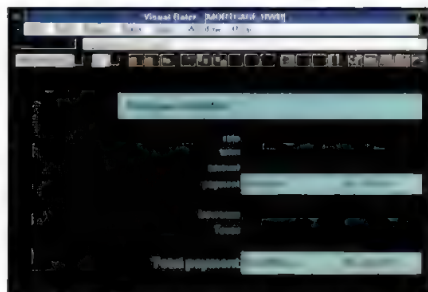
BY CRAIG STINSON

Visual Baler compiles spreadsheet applications into tamper-proof, standalone Windows executables, which can be distributed royalty-free and run without additional software (other than Windows 3.1). The \$499 product is stocked with point-and-click interface-design tools and is intended to put professional application development within reach of those who lack a deep knowledge of programming.

Built around a three-dimensional spreadsheet editor that looks like a conventional Windows spreadsheet program, Visual Baler takes advantage of familiar surroundings. You build your application's analytical structure using conventional spreadsheet for-

mulas and functions. Besides developing your application in Visual Baler's editor, you may import WK1/FMT or WK3/FM3 files, although you'll lose advanced features in the process.

To customize your application's user interface, you can call



BUILD: Visual Baler uses a spreadsheet editor to create full applications, including Windows .EXE files.

on the dialog and toolbar editors, as well as use Lotus-style macro commands to build custom menus and menu bars. Simple menu options allow you to remove the grid lines from

your finished application so your end user will have trouble recognizing its spreadsheet origins. A Viewport command lets you restrict the visible area of your worksheet to a particular range. With macros, you can restrict cell pointer movement to selected ranges or turn it off altogether. The program also includes a help-text editor, whose output can be fed to the included Microsoft Help compiler to generate Windows .HLP files.

Security options are plentiful. You can allow or disallow moves or copies; insertions or deletions; changes to cell type, constant cells, or formulas; and more. Most of these rules can be applied separately to keyboard/mouse or macro actions. Your own code, of course, can be hidden from the end user, and with a private lock number you can even hide your work from other Visual Baler licensees.

When it comes time to compile the finished product, Visual

Baler writes an .EXE file, along with about forty DLLs, a private .INI file, and a packing-list text file. The support files amount to a little over 2 megabytes; with compression, you can squeeze a moderate-size application onto a single floppy disk.

What's missing? Charting, OLE, ODBC connectivity, advanced analytic functions, crosstabs, goal-seeking, constrained optimization, and the ability to embed buttons and other graphics triggers on the worksheet. But for simple business applications, especially those that require bulletproof operation, Visual Baler is an attractive solution.

► **Visual Baler, Version 1.0.** List price: \$499. Requires: 4MB RAM, 8MB hard disk space, Microsoft Windows 3.1 or later. Baler Software Corp., 1400 Hicks Rd., Rolling Meadows, IL 60008; 800-327-6108, 708-506-9700; fax, 708-506-1808.

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PC tattooing	X	X	
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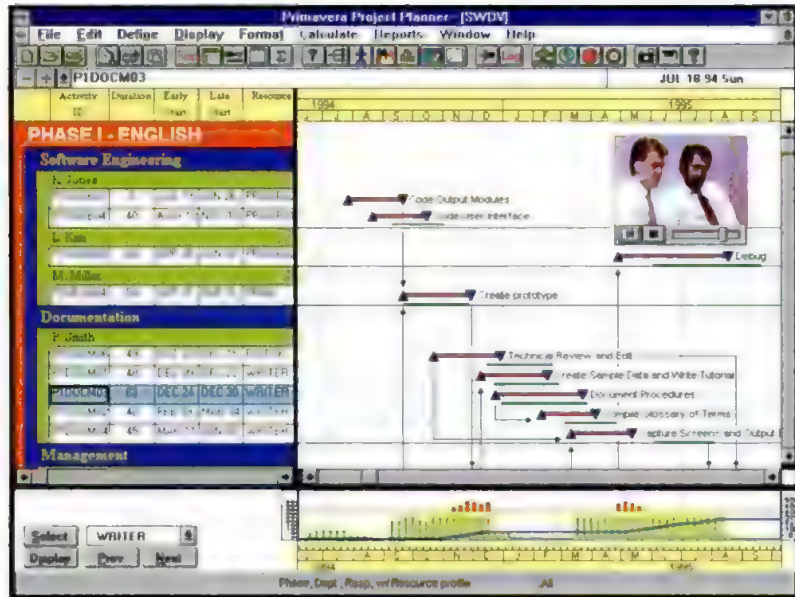
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All HP Vectra PCs come with MS-DOS® 6.2 and MS Windows for Workgroups 3.11 pre-installed; HP mouse and keyboard included. *Feature included with some models. †List price, dealer prices may vary. Monitor not included. ‡Other capacities available. †First year on-site, 24-hour service. Second and third year return to dealer. ‡Available 9/1/94. †With permission CRN/Benchmark. MS-DOS is a U.S. registered trademark and Windows is a trademark of Microsoft Corporation. Pentium and the Intel Inside logo are U.S. trademarks of Intel Corporation. PPG403 © 1994 Hewlett-Packard Company

Primavera Project Planner.[®]

Project management software that's so powerful,



Primavera Project Planner gives you unlimited ways to organize and format project information for better on-screen analysis and reporting. No other software uses Windows better for the project manager. Primavera takes full advantage of Windows functionality including drag and drop, Object Linking and Embedding, and more.

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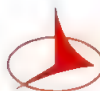
Primavera gives you unlimited ways to analyze your project. You can even organize and summarize by resources and WBS. You'll know the who, what, when, why and how much—and keep your project under control.

you'll wonder how you lived without it.



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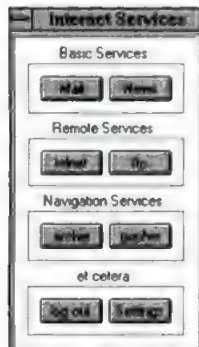
NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Adam A. Hicks

IMPROVED

Crosstalk 2.2 Lets You Point and Click Through the Internet

Digital Communications Associates Crosstalk for Windows, Version 2.2, communications software package, now includes an "Internet Helper" graphical Internet navigator. After you establish a service provider, DCA lets you create a special log-in script for the Internet. Once logged on, Crosstalk lets you use icons called "QuickPads" to navigate from one service or function to another, which they've divided into four groups. DCA also ships Crosstalk 2.2 with integrated fax services called Crossfax.



Crosstalk's QuickPads for navigating the Internet.

► **Crosstalk for Windows 2.2.** List price: \$179. **Crosstalk for Windows, Version 2.2 with Crossfax.** List price: \$195.

Digital Communications Associates Inc., 1000 Alderman Dr., Alpharetta, GA 30202-4199; 800-348-3221, 404-475-8380; fax, 404-442-4035.

Circle 404 on reader service card

IMPROVED

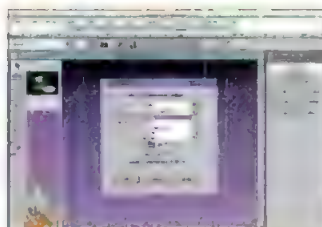
Clickbook: Pamphlets to Order

Clickbook, Version 1.01, from **BookMaker Corp.** was cited as one of the best Windows add-ons in *PC Magazine's* Best of 1993 because it lets you create short-run or single-copy booklets quickly. Clickbook is a printer utility that takes output from any of your Windows applications and scales, formats, and paginates the material into any of 20 different-size multipage booklets ready for you to fold, staple, and distribute. Version 1.1 supports color printing and eliminates the need for you to rotate the paper in the middle of a double-sided print job.

► **ClickBook, Version 1.1.** List price: \$69.95. **BookMaker Corp.,** 2470 Camino Real, #108, Palo Alto, CA 94306; 415-354-8160; fax, 415-856-4734.

Circle 405 on reader service card

HOT PROSPECT



Harvard Graphics 3.0 Lowers Its Entrance Requirements

Software Publishing Corp.'s Harvard Graphics 3.0 for Windows should prove even more successful than previous releases because it has added tools to make your presentations more professional, tools to make the package easier for you to use, and new features that help you to reduce the time it takes to produce your presentations.

Version 3.0 includes complete pre-designed presentations that let you plug in your data without thinking about the structure. Alternatively, you can create your own styles and save them in a custom library that you can update as needed. For a more professional look, the package even includes an animation player with 15 samples suitable for business and an autotrace tool for turning bitmaps into smooth vector images.

SPC has made its existing tools more accessible and interactive with simplified dialog boxes, more preview options, and expanded advisors and tutorials. The new version lets you launch other DOS and Windows applications from customizable icon bars and send a complete presentation as a MAPI or VIM mail attachment from within the application.

► **Harvard Graphics 3.0 for Windows.** List price: \$395; Upgrade from previous DOS or Windows versions or competitive products, \$99. **Software Publishing Corp.,** 3165 Kifer Rd., P.O. Box 54983, Santa Clara, CA 95056-0983; 800-234-2500, 408-986-8000; fax, 408-980-0729.

Circle 403 on reader service card.

NEW

Move Over, Aladdin; GENie for Windows Arrives On-Line

GENie, the on-line service from **General Electric Information Services** (discussed in "Making On-Line Services Work for You", March 15, 1994), has hundreds of thousands of users but has never had its own front-end. The new GENie for Windows program allows you to browse through GENie on-line using a graphical interface, or you can set up off-line navigation routines that automate your on-line sessions, thus cutting down on connect time. Having its own front-end software will make GENie a more appealing home for its on-line users, who will now have a task manager, a filing cabinet, an off-line text editor for creating mail messages, an address book editor, and a locate-and-notify feature for identifying other GENie subscribers. Considering the low cost for basic membership and the data you have access to, the addition of a graphical interface may be all GENie needs to attract a wider audience.



Now there's a graphical interface for the GENie on-line service.

► **GENie for Windows.** List price: Available free to users. **GE Information Services Inc.,** P.O. Box 6403, Rockville, MD 20849; 800-638-9636, 301-251-6475; fax, 301-340-4433.

Circle 406 on reader service card

NEW

Mobile Multimedia from ZDS

You don't have to buy a portable with a CD-ROM player or connect multiple peripherals to take your multimedia presentations on tour, because **Zenith Data Systems** has begun shipping the Z-Player a CD-ROM player and speaker system in one. The unit connects to most portables with 512K VRAM and a type



Z-Player: Only 2 pounds with battery.

New & Improved

II PCMCIA slot. The double-speed MPC-compliant CD-ROM drive has an integrated 16-bit sound card and can play back either computer CDs, photo CDs, or standard music CDs through two stereo speakers. The 2-pound unit runs on a single rechargeable nickel cadmium battery pack or six AA size batteries. The batteries will give you 30 to 45 minutes of continuous use with CD-ROMs or 1 to 2 hours of continuous audio playback.

► **Z-Player.** List price: \$499. Zenith Data Systems, 2150 East Lake Cook Rd., Buffalo Grove, IL 60089; 800-533-0331, 708-808-5000; fax, 800-472-7211.

Circle 407 on reader service card

NEW

Manage Multimedia Overload

File management was difficult enough before you began dabbling with multimedia files (image, video, and audio files), and now it seems downright unruly. But ESP Media Library 1.0 for Windows, from **Educational Software Products**, offers a solution that will save you both time (that you would have spent searching for files) and disk space on your local hard disk. Using this package, you can create a database by adding searchable titles and other characteristics to your multimedia files, which are stored centrally in a compressed format.

You can import files directly from the library into another application, or you can operate within the library to do file management, edit and view files (the package will launch the editor or viewer you require), and even see a slide show of all the image files in your library. ESP Media Library supports .BMP, .DIB, .GIF, .PCX, Targa, and TIFF (image files), both .MID and .WAV (audio files), and .AVI (Microsoft Video for Windows, Version 1.0 files).

► **ESP Media Library, Version 1.0 for Windows.** List price: \$49. Educational Software Products Inc., P.O. Box 4532, Ithaca, NY 14852; 607-257-5271.

Circle 408 on reader service card

IMPROVED

askSam 2.0 Free-Form Database Accepts Data More Freely

askSam for Windows, from **askSam Systems**, is a free-form database that doesn't require you to fit your data to a structure before you import it. Instead, with askSam you can first dump files with different formats and then create your structure, making it a tool of

BRIEFS

Software

Microsoft Corp. has released MS-DOS 6.22 (\$77.95), which implements Microsoft's own compression algorithm (developed during the now resolved lawsuit with Stac). The upgrade is available in retail channels as a \$9.95 step-up product, or you can download it from CompuServe or Microsoft's BBS. 800-426-9400, 206-882-8080

Mustang Software is shipping its Wildcat!, Version 4, BBS software along with a suite of other BBS products all for only \$999. The group of packages includes Wildcat! Version 4 BBS software; wcPRO utilities for tasks such as tracking statistics and fax-on-demand processing; wcGATE, a messaging gateway that handles Internet e-mail; and wcCODE, a development toolkit for writing custom applications and designing Wildcat!'s interface. 800-999-9619, 805-873-2500

Rand McNally, the 183-year-old map-making company, is going digital with an all new trip-planning software package that covers the North American continent. TripMaker (\$79.95) has trip-planning tools that let you plan by distance, time, or attractions and create a corresponding budget. The package can also print out trip itineraries that indicate correct page numbers within the Rand McNally Road Atlas. 800-671-5006 ext. 307.

Accent word processing software from **Accent Software** (introductory price, \$299) is a Windows word processing program with an international focus. The program supports writing and keyboard layouts for over thirty languages and includes utilities for many of them such as spell-checking, thesaurus, and Berlitz interpreter. The package currently supports Western, Eastern European, Cyrillic, Greek, and Turkish alphabets, with support for Semitic and Asian versions coming out in the future. 800-535-5256

Research Publications International shipped Broadcast News CD-ROM, Version 2.0, a CD-ROM collection of full-text transcripts for over 80 television and radio news programs. The new

choice for coordinating searches of information with different structures (such as joining up all those ftp downloads you've culled from the Internet). Now in Version 2.0, askSam lets you import data from new filters including comma and tab delimited, fixed position, CompuServe, the Internet, Lexis, and Nexis. Other enhancements have been made to the interface and functionality so that you can now customize toolbars, perform mail-merges, lay out reports by dragging and dropping fields, search multiple databases for text strings, and place bookmarks within documents that act like hypertext links to other points in the database. The latest version also lets you scan text directly from its \$99 OCR (optical character recognition) module.

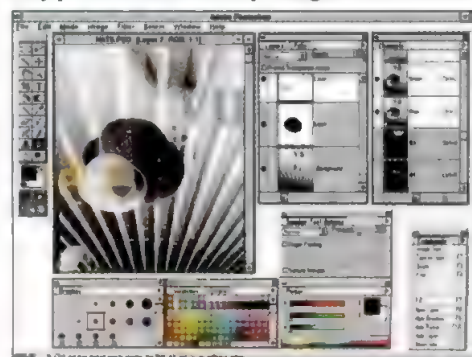
► **askSam for Windows, Version 2.0.** List price: Introductory price, \$149.95. askSam Systems, P.O. Box 1428, Perry, FL 32347; 800-800-1997, 904-584-6590; fax, 904-584-7481.

Circle 409 on reader service card

IMPROVED

Adobe Adds More Artistic Control to Photoshop 3.0

Adobe Systems synchronized the release of Adobe Photoshop for Windows 3.0 with the Macintosh release, making the same set of features available for users of Windows PCs and Macintosh systems at the same time. Version 3.0 gives you more of the professional quality tools Photoshop is known for including lighting effects, better retouching, and more filters. Exploring different designs and effects is made faster and easier in 3.0 thanks to multiple layer support, which lets you mix and match ideas the way you would manually using acetate sketch-



Photoshop 3.0 features adjustable palettes for custom layout of your workspace.

es. You can now control the proportion of inks in a color in absolute or relative values and place those colors more accurately within a photo with full previewing and correcting mechanisms. You can control the placement of

A full-page photograph of a cowboy riding a bucking bull. The cowboy is wearing a red shirt, blue jeans, and a white cowboy hat. He is leaning forward, holding onto the bull's horns. The bull is white with brown spots and is bucking over a white fence. The background is dark and out of focus.

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Texas comes easy.
But some things do...

Printers from
Texas Instruments.
Right out of the box,
they're easy.



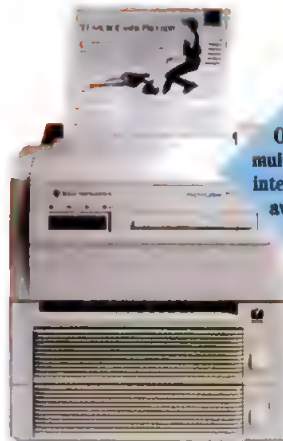
**microMarc™
Color Printer**
Under \$400.

The easy way to brighten up your documents. This **flexible color/black and white inkjet printer** adds vivid color to your work and brings newsletters, proposals and even schoolwork to life. Windows™/DOS compatible at a price that's easy to handle.



**microWriter™ PS23
Printer**
Under \$750.

An **entry-level, laser-quality printer** for small businesses and home users. 300 dpi, 5 pages per minute, 23 scalable fonts, Mac™/Windows/DOS compatible.



**microLaser™
Pro 600 Printer**
Under \$1,350.*

The easy solution for users looking for a **feature packed, high performance 600 dpi printer**. It comes standard with a printing speed of 8 pages per minute, 6 MB memory, two 250 sheet paper trays. Mac/Windows/DOS compatible.



**microLaser
PowerPro Printer**
Under \$1,750.

Easily one of the fastest 600 dpi printers for the price, and **ideal for heavy graphics printing**. Start with the Pro 600 and add a blazing 12 pages per minute, a turbo charged processor, and more scalable fonts. Mac/Windows/DOS compatible.

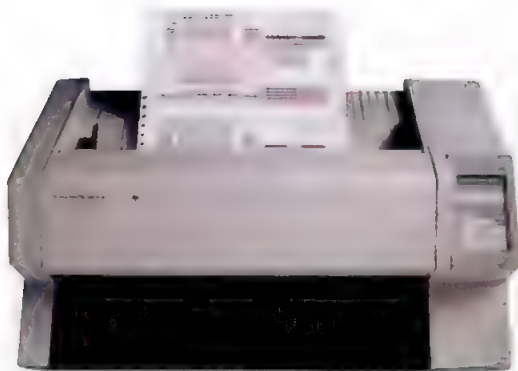


microLaser Pro 600 is winner of these fine awards.

microWriter is winner of these fine awards.

Standard on microLaser Pro 600, microLaser PowerPro, microWriter PS33.

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**8920
Forms Printer
Under \$2,400.**

A heavy duty *dot matrix printer*
for up to 9-part business forms.
Adjustable 18-pin printhead, five
print speeds, Windows/DOS
compatible, zero tear-off for
form waste elimination.

You won't get thrown by a TI printer. You'll find 20 years of experience designed into a line of printers that redefines easy. A family of friendly printers that extend your reach – without extending your budget.

Easy to use. Take the guesswork out of setting up our family of page printers with features like TI's new Easy Select Windows Drivers. Just a few simple steps and your printer driver is automatically installed on your hard drive, without worrying about which buttons to push or which port to connect to. You'll find other friendly features like the Color Magic™ driver on our microMarc Color inkjet printer. It has easy to understand menus so even a beginner can print professional quality documents.

Easy to maintain. You'll find our printers virtually trouble-free. From printheads to toner cartridges to imaging units, our long-life consumables can be dropped into place in seconds — and they're economical enough to give you a very low cost per page. We have even eliminated the need for special tools to upgrade your printer. To add more memory to our microWriter or microLaser printers, simply remove two thumb-screws, pop in the board and you're done.

Easy to service. We've built our printers to be trouble-free, complete with a one-year limited warranty and a toll-free technical support line. So if you do have a question, you get live, friendly assistance from professionally trained technicians.

Easy to own. Our printers have the friendliest prices around. And we're so sure you'll like them, we offer a 30-day risk-free trial* to make sure you're perfectly satisfied.



Easy to buy. Just call **1-800-TI-TEXAS** (1-800-848-3927). Ask us anything you want. We'll send you literature and competitive comparisons within 24 hours with all the details you'll need to find the TI printer that's just right for you.

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microWriter, microLaser Pro 600.



excluding the 8920 Forms Printer.

*Includes a \$150 rebate on PS23 models purchased from July 1 through August 31, 1994. Dealer prices may vary.
†Offer applies to all new microMarc, microWriter, microLaser, and 8920 Forms printers, if returned in good condition.

**TEXAS
INSTRUMENTS**

New & Improved

your palettes on the screen, and there's a customizable commands palette where you can collect your most often used commands in one easily accessible spot.

► **Adobe Photoshop, Version 3.0.** List price: \$895. Adobe Systems Inc., 1585 Charleston Rd., Mountainview, CA 94039-7900; 800-833-6687, 415-961-4400; fax, 415-961-3769.

Circle 410 on reader service card

NEW

PS6: ODBC Capabilities for Proactive Project Management

To utilize the added ODBC flexibility in **Scitor Corp.'s** release of Project Scheduler 6 for Windows, Version 1.5, you'll still need to be well versed in project management. The package now includes added levels of data granularity, new reporting ability, and better communications. However, it remains a bargain compared to some others in this category, which can run as high as \$3,000, and it continues to add powerful features—such as selectable ODBC data fields for import that will let other departments in the company share the key elements of your project planning. Individual tasks can now be split, so you can accommodate better resource management. New reports have also been added, and the package now lets you capture a complete PS6 environment into a single file to make transferring project information easier.

► **Project Scheduler 6 for Windows, Version 1.5.** List price: \$695. Scitor Corp., 393 Vintage Park Dr., #140, Foster City, CA 94404; 415-570-7700; fax, 415-570-7807.

Circle 411 on reader service card

NEW

Deltec UPS Protects Your PC Without Hurting Your Pocketbook

The advantage of an off-line UPS system is low cost, but the trade-off is that battery rundown and recharge may leave a system exposed to power failures. The PowerRite Plus series of off-line UPS systems from **Deltec Electronics Corp.**, are the little siblings to the *PC Magazine* Editor's Choice-winning PowerRite Pro (Keeping Up with UPSs, September 14, 1994). They include Deltec's battery management feature, which provide adequate protection for a standalone PC or network node without requiring you to spend a lot of money. Best of all, if the battery management system detects any problems, you can call Deltec and they'll ship you another unit so you

BRIEFS

Software

release will automatically widen your word searches to include related topics in the database, and it has a help screen to walk you through the results of your searches. Version 2.0 can print either selected pages in a transcript or the entire document. The CD-ROM works with DOS or Windows. Prices start at \$595 for a one-year subscription. 800-444-0799, 203-397-2600.

Disk Technology

3M Corp. is reinforcing all of its 2MB 3.5-inch disks. The new Go Anywhere disks will provide added protection against static, dust, and other debris. They also have been redesigned to reduce friction during rotation and stand up better to a wider range of climate conditions. These disks will remain the same price as previous 3M disks and will silently replenish the retail channels' supply of "conventional" disks. 800-888-1889 ext. 250.

CD-ROM Drives

Portable Solutions new Autobahn CD-ROM drive (\$430) is a double-speed drive with a 300K data-transfer rate and an average seek time of 320 ms. It connects through the your notebook's printer parallel port. 714-632-1123.

Plextor has a quadruple-speed CD-ROM drive with a 600K data-transfer rate, 220-ms seek time, and a 1MB memory buffer. The drive can be purchased either as an internal or external model. The \$549 4PLEX PX43CH is one of the first quadruple-speed internal CD-ROM drives that fits in a standard 5.25-inch form factor. The \$649 4PLEX PX-45CH external drive is PC and Macintosh compatible. Both units are available with a 16-bit SCSI interface board for \$50. 800-475-3986, 408-980-1838.

Warnes Technology Corp.'s CDD-120 CD-ROM drive has a standard IDE interface. This a double-speed drive has 300K data-transfer rate, 230-ms average seek time, and a 512K cache. The \$189 ATAP-IDE standard unit connects directly to the PC through the cable used by your existing IDE hard drive. 408-458-8838.

don't have to deal with the battery disposal. The Plus family line is available for 250VA, 400VA, or 600VA power ratings in either 50- or 60-Hz models. The units come with a five year warranty.

► **PowerRite Plus.** List price: starts at \$139 for a 250VA unit. Deltec Electronics Corp., 2727 Kurtz St., San Diego, CA 92110; 800-854-2658, 619-291-4211; fax, 619-291-2973.

Circle 418 on reader service card

NEW

Portable Tape Drive Packs 1.25GB of Storage in 10 Ounces

With the Pereos hand-held tape drive from startup manufacturer **Datasonix Corp.**, you may be able to get ahead of the insatiable storage demands of portable users and have some means of backing up the increasingly valuable data being taken on the road. Weighing a slim 10 ounces, the Pereos will run for up to four months on two AA batteries. The unit will store a whopping 1.25GB on a tape (\$49.95) the size of a postage stamp and has an average seek time of 90 seconds. After you connect the Pereos to the portable via a parallel port, the included software lets you upload and download files or perform backups at a 10MB-per-minute data-transfer rate with compression and a 5MB-per-minute rate without compression. If you need to attach a printer at the same time as the Pereos backup unit, an optional splitter cable is available.

► **Datasonix Pereos.** List price: \$595. Datasonix Corp., 5700 Flatiron Pkwy., Boulder, CO 80301; 800-328-2779, 303-545-9500; fax, 303-545-9249.

Circle 413 on reader service card



Pint-size Pereos for portable backups.

NEW

Project Gateway Unites Project Management Software with Notes

Project Gateway from **Marin Research** is a tool that truly steps into the role of project manager by integrating Microsoft Project and Symantec Time Line project management software with Lotus Notes. This integration lets you export and synchronize your Project or Time Line data into a Notes Database complete with to-do lists and status report capabilities. Members of your workgroup can now report on

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April 12, 1994
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June 28, 1994
DX4-100



April 1994
Pentium-60
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March 1994
486DX2-66

ZEOS DESIGNED PANTERA

ZEOS has earned an unparalleled ten awards for its Pentium processor-based Pantera. These top awards from leading computer experts mean one thing—the ZEOS Pantera is your #1 Pentium processor-based system.

Numerous companies offer Pentium processor-based systems. So what makes the ZEOS system the consistent winner—review after review?

The ZEOS Pantera is a completely original design—from start to finish. Many competitors use the same cookie-cutter motherboard, drop in a few service parts, add their name, and then claim to have a good computer.

Not at ZEOS. We start with a ZEOS designed motherboard, one that is created specifically to take full advantage of the latest technological advancements employed in each system. The Pantera motherboard is stocked with exceptional features such as a hot new ZEOS designed, on-board PCI Local Bus IDE Controller that, as *PC Magazine* said, “pushes disk access into new territory.” The PCI Controller allows up to four IDE devices to be connected directly to the system’s PCI bus, enabling you to experience faster performance and greater flexibility.

For further performance breakthroughs we’ve included a new 64-bit PCI video controller for super-fast Windows-acceleration.

The Pantera’s performance puts it far ahead of others. *PC World* reported: “ZEOS Pentium-90 is the fastest system we’ve tested...they don’t come any faster.” They went on to say that the Pantera-66 is the “fastest Pentium-66...a fortuitous blend of power and price.”

The ZEOS Pantera received the highest scores in all benchmark tests run by *Windows Sources*. “The clear winner was the ZEOS Pantera. Its scores were the best across the board.”

FLEXIBLE OPTIONS

For the most options and the greatest flexibility we offer you a choice of processors. The

Pantera line is available with processors from 486SX to DX4 to Pentium.

There’s more. These expanded and even more affordable Pantera power packages include local bus IDE hard drives from 214MB to 1GB; memory from 4MB to 24MB; and three PCI slots (one contains our new PCI local bus video card) in addition to five ISA slots; and an on-board Fast SCSI-2 option.



Standard on every system are extras like two cooling fans and a built-in surge suppressor for increased reliability and longevity. In

addition, all Pentium processor-based Panteras feature integrated business audio for voice annotations and presentations.

With many affordable options and upgrades, we can also custom configure a Pantera system to meet your computing needs!

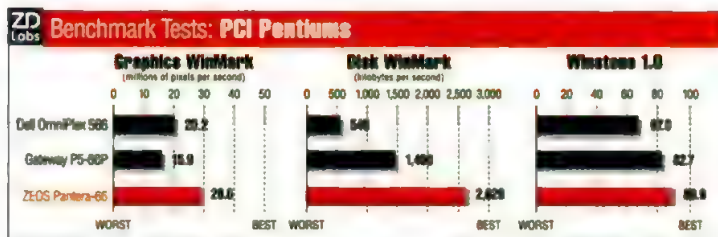
THE EXTRAS INCLUDED

Whether Pentium, DX4 or 486, all ZEOS Pantera computers are 100% compatible with every major network operating system on the market including Novell NetWare.

You get all this at a marvelous price. There’s no doubt about it. *PC/Computing* said: “Hot performance, room for expandability, and a low price make this system our top choice.”

And the value doesn’t stop at the time of your purchase. You get the best service and support in the business. No company has won more *PC Magazine* Readers’ Choice for Service & Reliability awards than ZEOS—six in all. We were the first to provide 24-hour toll-free technical support—every day—for *quick and accurate* answers to all your technical questions.

As *PC/Computing* said, “This is a deal you simply can’t pass up.” It’s power beyond power. It’s the Editors’ Choice. Make it your choice. Call a ZEOS Systems Consultant today at 800-554-7172.



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- 1** Choose the ZEOS system package you want. (A sampling of our *Computers Now!* packages is shown below.)
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We can upgrade your *Computers Now!* desktop or vertical system with a larger monitor—and still ship it the same day you order!*



Ambra™
486SX-25
\$1195

PACKAGE #1:

- 4MB RAM, 128K SRAM cache
- 214MB hard drive, 32K cache
- 3.5" 144MB floppy drive
- VESA local bus SVGA color video
- SVGA color monitor
- DOS, Windows for Workgroups, Microsoft Mouse



Pantera
486DX-33
\$1945
486DX2-66
\$2045

PACKAGE #2:

- 8MB RAM
- 528MB local bus IDE hard drive, 256K cache
- 2X CD-ROM drive, 3.5" 144MB floppy drive
- PCI local bus SVGA video
- SVGA color monitor
- DOS, Windows for Workgroups, Microsoft Mouse



Pantera
486DX2-66
\$2495

TOP GUN:

- 8MB RAM, 256K SRAM cache
- 528MB local bus IDE hard drive, 256K cache
- 2X CD-ROM drive, 3.5" 144MB floppy drive
- Diamond Stealth 64/PCI local bus graphics with 2MB RAM
- 15" SVGA color monitor
- 14,400 bps V32 bis send/receive fax modem
- DOS, Windows for Workgroups, Microsoft Mouse
- Choice of Lotus Windows application



Pantera
DX4-100
\$2895

EDITORS' 100:

- 16MB RAM, 256K SRAM cache
- 528MB local bus IDE hard drive, 256K cache
- 2X CD-ROM drive, 3.5" 144MB floppy drive
- Diamond Stealth 64/PCI local bus graphics with 2MB RAM
- 14" SVGA color monitor
- DOS, Windows for Workgroups, Microsoft Mouse
- Choice of Lotus Windows application



Pantera
Pentium-66
\$3095
Pentium-90
\$3395

EDITORS' CHOICE:

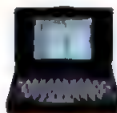
- 16MB RAM, 256K SRAM cache
- 528MB local bus IDE hard drive, 256K cache
- 2X CD-ROM drive, 3.5" 144MB floppy drive
- Diamond Stealth 64/PCI local bus graphics with 2MB RAM
- 15" SVGA color monitor
- 10-bay vertical case
- DOS, Windows for Workgroups, Microsoft Mouse
- Choice of Lotus Windows application



Pantera
Pentium-66
\$3638
Pentium-90
\$3938

BEST MM:

- 16MB RAM, 256K SRAM cache
- 528MB local bus IDE hard drive, 256K cache
- 2X CD-ROM drive, 3.5" 144MB floppy drive
- 16-bit sound card, stereo speakers
- Diamond Stealth 64/PCI local bus graphics with 2MB RAM
- 17" SVGA color monitor
- 10-bay vertical case
- DOS, Windows for Workgroups, Microsoft Mouse
- Choice of Lotus Windows application



Contenda
486SL-25
\$1544

PACKAGE #2 PLUS:

- 4MB RAM
- 80MB IDE hard drive
- External 3.5" 144MB floppy disk drive
- Internal fax modem
- DOS, Windows for Workgroups
- Lotus Organizer
- 9.7" x 6.1"; 3.9 lbs.



Freestyle
486SL-33
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- 260MB IDE hard drive
- Internal 96/24 send/receive fax modem
- Custom carrying case
- Extra battery
- External charging stand
- DOS, Windows for Workgroups
- 8.5" to 11.3" x 1.75" to 2.25"; 5.6 lbs.

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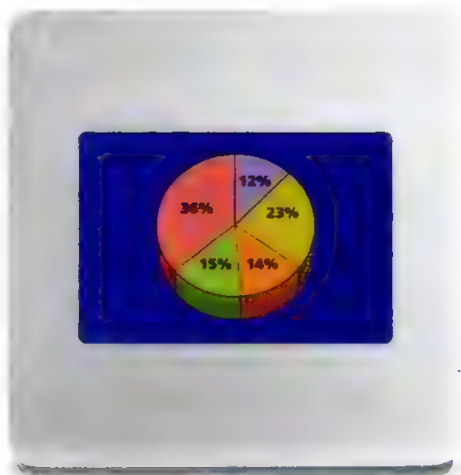


*Orders must be for *Computers Now!* configurations; we've listed just a sampling here. Since we continuously update this list of configurations, please call to confirm your system is on the list. This offer is good only as long as these pre-built systems remain in stock. Other ZEOS systems and custom configurations may take slightly longer—about a week. All orders are subject to credit approval. Monitor upgrades available on all desktop *Computers Now!* packages. Orders must be received by 1 p.m. Central Time, M-F.

Purchase orders are subject to approval. Business leasing programs available. Lease prices based on a 36-month lease; 10% purchase option. All prices, specifications and availability are subject to change without notice; call to confirm these and warranty details. Prices do not include shipping. Novell compatibility is Developer Tested Only. Novell makes no warranties with respect to this product. All products and company names are trademarks or registered trademarks of their respective holders. Intel Inside and Pentium Processor Logos are trademarks of Intel Corporation. ZEOS and Contenda are registered trademarks; Z-Card and *Computers Now!* are registered service marks; Pantera, Freestyle and Ambra are trademarks of ZEOS International Ltd. ©1994 ZEOS International Ltd., 1301 Industrial Blvd., Minneapolis, MN 55413 USA. ZEOS is a publicly traded company (NASDAQ symbol: ZEOS).

CIRCLE 155 ON READER SERVICE CARD

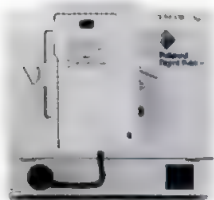
MAYBE YOUR SLIDE HOUSE SHOULD GET A SMALLER PIECE OF THE PIE.



\$20, 12 hours.



50¢, 4 minutes.



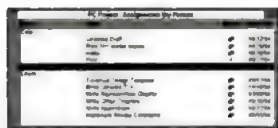
If you're paying rush charges for 35mm slides from a service bureau, you're paying too much. Even if you're not, you're still paying too much — unless you're using the Polaroid Digital Palette 35mm desktop slide printer.

Slide for slide, it's the same quality but 10 to 40 times less expensive. And 10 to 100 times faster. Making the slides is as easy as pie, too — just a few mouseclicks with your computer. Give the Digital Palette slide printer a try. And give your slide house their just desserts.

For a free interactive demo diskette on this award-winning technology, call 1-800-816-2611, ext. 961.

Polaroid.

the amount of time they've put in, how far along they are, and what remains to be completed. The package tracks and coordinates all this data and allows you to go back, make revisions, and send out revised schedules without changing your original model. Project Gateway also includes a



Project Gateway creates a to-do list in a Notes database.

version of Charts Now! from Foundation Microsystems that allows members to receive Gantt charts of their assignments or of the whole project without having to run the full project management application.

► **Project Gateway.** List price: *starter kit with software for three workstations, \$895.* Marin Research, 38 Miller Ave., #10, Mill Valley, CA 94941; 415-389-5444; 415-389-5448.

Circle 414 on reader service card

NEW

An Electronic Shout Across the Office with QuickFlash

QuickFlash messaging software from **The ADM Group** is great for those of us who haven't quite mastered the intricacies of NetWare Send commands but still need something more from the information age than notes on the backs of chairs. This Windows-based network software sends urgent messages that require immediate responses without requiring you to leave the application you're working in. You can send messages to a single person, more than one person, or groups.

Messages can be your own text or prefabricated notes (such as "Want to get some food?"), text files, or even screen captures. You have the option to receive all notes and quickly reply or leave a message indicating that you're away from your desk. It also has a "do not disturb" message option that lets you collect messages to be read later, although this seems to miss the point (but it will at least let the person know you're incommunicado).

► **QuickFlash.** List price: *\$249, 10-user pack; \$399, 25-user pack.* The ADM Group, 477 Madison Ave., 17th Floor, New York, NY 10022; 212-371-4900; fax, 212-750-7419.

Circle 415 on reader service card



QuickFlash notes are easier than e-mail.

BRIEFS

Color Laser Printers

QMS's \$10,999 QMS Magicolor Laser Printer is configured with 28MB of RAM and is capable of outputting color text and graphics at 600- by 600-dot-per-inch resolution. The printer outputs 8 pages per minute in monochrome and 2 ppm in color. You can use QMS CrownNet Technology to network the unit to a variety of different operating systems. The Magicolor printer is also available with 12MB of RAM for \$9,999. 800-523-2696, 205-633-4300.

Xerox Corp. is also shipping a color laser printer that falls under the \$10,000 price point. The Xerox 4900 Color Laser Printer (\$8,495) has up to a 1,200- by 300-dpi resolution utilizing Xerox's quad-dot technology. The 4900 will print three pages per minute with one color on a page, two ppm for a two color page, and a maximum of 12 ppm for monochrome printing. The unit is powered by a 25-MHz AMD 29030 RISC-based controller and comes standard with 12MB of RAM (upgradable to 48MB). 800-275-9376 ext. WT4900.

And Finally

As mentioned above, **QMS** has released a new color laser printer, so the older ColorScript Laser 1000 color laser printer gets marked down 20 percent to \$7,999. . . **Socket Communications** has lowered the prices of its PCMCIA ethernet adapters. The EA 10BaseT Ethernet adapter drops \$50 and is now priced at \$249. The EA+, which supports both 10BaseT and 10Base2, has dropped \$70 to \$299. . . If you expected to pay a lot for a Pentium chip, you may be surprised at some of the prices you can get. **Micro Express** will upgrade your PC to a 60-MHz Pentium for \$999. For complete upgrade info, dial 800-989-9900. . . Or you can call **Dell** and get a Dell Dimension XPS 60-MHz Pentium desktop system including a 340MB hard drive, 8MB RAM, and a 15-inch monitor for only \$1,999. The number is 800-289-3355. . . **Marcan**, distributor of JVC Information Products, is shipping CD-ROM Recorders at considerable discounts. The half-height internal 5.25-inch Personal Archiver is \$3,295 (down from \$4,100), and it now includes software that was formerly a \$500 option.

NEW

Notable Technologies Ships Wireless Messaging in a Box

Besides a modem, **Notable Technologies'** AirNote package combines all the software, hardware, and servicing options you'll need to set up a connection between a PC and a mobile worker's alphanumeric pager. The Windows software lets you send messages to groups of up to ten people, reuse preset messages, and keep a log of every message sent. Pagers can be accessed from AirNote software directly or from another on-line service or e-mail package that can send Internet mail. Notable Technologies bundles a three-button NEC Alpha Numeric pager unit that has the standard backlit display of up to 80 characters and a 5,750-character memory, and each pager has a unique Internet mailing address. You can choose services that will allow you to send your pages locally or to many international locations, with pricing options dependent upon the package you choose.

► **AirNote.** List price: *\$349.* Notable Technologies Inc., 2030 Franklin St., 4th Floor, Oakland, CA 94612; 800-732-9900, 510-208-4400; fax, 510-444-4493.

Circle 416 on reader service card

NEW

Clary Creates Guardian for Local Area Power Protection

Clary Corp., known for its line of uninterruptible power supply (UPS) units for mini-computers and large mainframe systems, has introduced the OnGuard LI-450. This on-line interactive unit is targeted towards LAN file servers that may not require the complete protection of on-line systems but need better protection than less costly off-line systems (which can allow unacceptable gaps in power flow). The unit has a built-in microprocessor and an RS-232 port, so it can handle network monitoring. The LI-450 ships with standard diagnostic software that will give you real-time utility line analysis and battery monitoring. Clary also offers optional software called DataSave Plus (\$99 for DOS or Windows), which will record and execute a user-programmable shutdown procedure and, with the network version, enable one LI-450 to protect up to four systems.

► **OnGuard LI-450.** List price: *\$477.* Clary Corp., 1960 S. Walker Ave., Monrovia, CA 91016; 800-442-5279, 818-359-4486; fax, 818-305-0254.

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ALLOWING YOU INSTANT FAX,
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OTHER CAPABILITIES.



MPC Technologies, Inc., offers a complete
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MODEL 775	
MONOCHROME, 486 DX4-75, 8MB RAM, 340MB HDD	\$2,199
DUAL SCAN COLOR, 486 DX4-75, 8MB RAM, 340MB HDD	\$2,689
MODEL 799	
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MPC products incorporate ergonomic fea-
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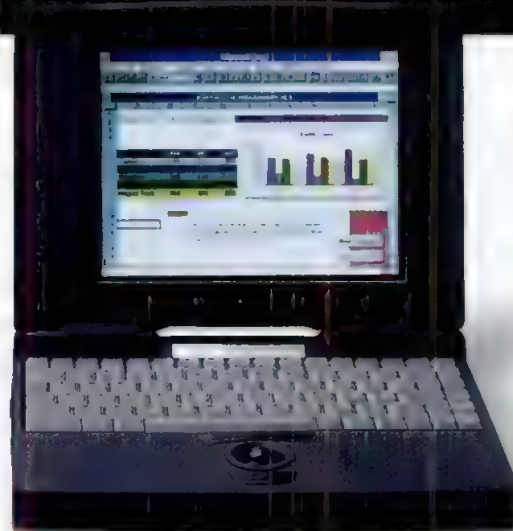
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sound capability.

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UPGRADEABLE CPU LETS
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PUTING POWER AS YOUR
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MODEL	MPC 775	AMBRA N100T	TOSHIBA T4800CT
PRICE	\$2,689	\$3,199*	\$5,499*
PROCESSOR	75MHz: DX/4	75MHz: DX/4	75MHz: DX/4
3.3V DESIGN	Yes	CPU only	Yes
AUDIO	16-bit	8-bit	16-bit
DISPLAY	Color Dual Scan	Color Dual Scan	Color TFT
HARD DISK	340MB	340MB	500MB
RAM	8MB	4MB	8MB
PCMCIA	1 of Type IV	1 of Type III	1 of Type III

*Manufacturer's suggested price, 4/94, 5/94; actual prices may be different.

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CIRCLE 177 ON READER SERVICE CARD

**IF PATIENCE
IS A VIRTUE, THEN
WE MUST BE
GOING TO HELL.**



At Xircom, heaven help us, we have just created the fastest CreditCard Ethernet adapter ever made.

As the inaugural member of our



The Xircom Corporate Series is the latest version of our original CreditCards which have satisfied twice as many users as all other manufacturers combined.

new Performance Series, this little speed demon appeals directly to the devious part of your mind that says waiting is for those in line behind you.

We must confess, this card has tested a blistering 40% faster than its closest "competitor" (for want of a better word), and up to 120% faster than others, in some environments.

All thanks to advanced, Look-Ahead Pipelining and unique full duplex capability. Which increases the raw data rate of the network. More importantly however, this allows you to send and receive messages at the same time.

All this amounts to one thing: Pure speed. Pure, unprecedented, pressed-back-in-your-office-chair kind of speed which not only makes

your applications scream, but your colleagues whisper. And all for just around \$50 more than Xircom's original and best-selling CreditCard LAN Ethernet Adapters, now known as our Corporate Series.

But the temptations don't end there. Xircom also offers you a new Performance Series Token-Ring CreditCard. And every Performance Series product comes with all the benefits you find in the Corporate Series. Features such as guaranteed compatibility with every make and type of notebook. The widest range of NOS support available. Along with unmatched ease of use (our new Windows-based installation utility gets you running in under a minute).

Check List	Xircom	Others
Ethernet Support	✓	?
Token-Ring Support	✓	?
Modem+LAN Available	✓	No
Cordless Available	✓	No
Advanced Look-Ahead Pipelining	✓	?
Full Duplex Support	✓	No
Advanced Power Management	✓	No
HotSwap Support	✓	No
Suspend/Resume Support	✓	No
Windows Installation and User Utilities	✓	No
DOS, Windows, OS/2, NT & Unix Support	✓	?
Card & Socket Service Vendor Support	6	?
Network Operating System Support	48	?
Notebook Machines Certified	85	?
Guaranteed Compatibility	✓	?
Lifetime Product Warranty	✓	?

Check out these facts. You'll find that what comes standard from Xircom makes our LAN adapters anything but standard.

With all this, it's no wonder that Xircom has connected over twice as many notebooks to LANs as all other LAN adapter vendors combined. In fact, there are already over one

million satisfied Xircom LAN adapter users throughout the world.

Our rigid quality control and our comprehensive spectrum of tests ensure that every Xircom LAN adapter will stand up to the heat of the real world. Which is why all of our products come with a lifetime warranty. At least for this lifetime.

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Five Good Reasons To Buy Peachtree Accounting For Windows.



December 18, 1993



March 1994



January 1994



March 1994



January 25, 1994

First It Won Every Major Award. Then We Made It Better.

Now more than ever, Peachtree Accounting for Windows is the easiest, most powerful tool you can use to build your business.

The critics were already raving about Release 2.0. Now we've taken real-world input from users to make an incredible program even better.

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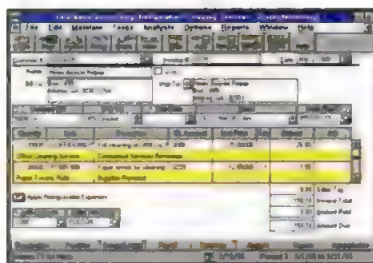
And Release 3.0 includes support for multiple users and networks at no added cost.

Unlike so-called bookkeeping programs, you'll have the solid foundation of true

double-entry accounting working for you every step of the way. And using it couldn't be easier. You just fill out on-screen forms that look like the purchase orders, invoices, and checks you use every day.

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If this were only an accounting package, it would still be the best in the business. But Release 3.0 offers much more.



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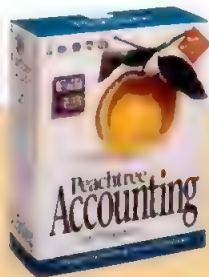
The new Manager's Series lets you keep track of who owes you money, who you owe, and allows you to play out "What if?" scenarios. Easy to read bar and pie charts help you monitor your financial status. And if you

want to see more detail about a particular figure, just double-click.

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System Requirements: IBM Compatible 386 or higher, DOS 3.3 or higher, Windows 3.1 running in standard or enhanced mode, 4 MB RAM, 12 MB free hard disk space, VGA or higher monitor, mouse. Works with any Windows 3.1 compatible printer.
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CIRCLE 393 ON READER SERVICE CARD

Read Only

REVIEWS OF THE LATEST BOOKS FOR THE PC USER

Edited by Tin Albano

Surviving—and Thriving— In a Digital World

BY N. JEANNE SMITH

Computer technology permeates our lives. In *Electronic Invasion: Brave New World of Business Communications*, technology consultant Cheryl Currid says we can understand and profit from the current information invasion—or eat the dust of those

who do. And in *Digital Woes: Why We Should Not Depend on Software*, author Lauren Ruth Wiener says we must learn the ways in which computers affect our lives so we can determine how best to use technology without becoming overly dependent on it.

PROFIT FROM THE INVASION

Many who use computers every day in the workplace have acquired limited knowledge about them—what Currid calls a “hit-or-miss” education resulting in “semi-computer-literacy.” Even when the level of knowledge is high, it’s hard to keep up with the brisk winds of change in this industry. Currid offers a map of business communications’ past, present, and future, guiding readers to fill in information gaps and take advantage of the tools available.

Did you ever make an embarrassing e-mail faux pas because you didn’t fully understand how the system worked? Ever save a private file in view of every user on a LAN? It’s nothing to be embarrassed about; we all have.

Currid explains e-mail, LANs, faxing, voice mail, on-line

services, mobile computing, and video teleconferencing, with recommendations and predictions for the future. The book is also chock-full of interesting appendices that include self-tests in computer literacy, a glossary of computer terms, and a listing of on-line services.

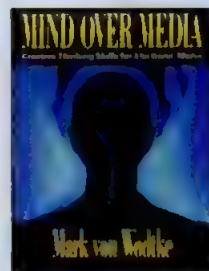
Electronic Invasion is a comprehensive presentation of electronic communications in business, with specific examples and practical guidelines. Technical terms are clearly defined. Use this book to gain general understanding, then move to more narrowly focused material on specific areas of interest.

WOE ARE WEP

When we depend on something, we implicitly agree to accept the consequences should it fail. Software, contends Lauren Ruth Wiener in *Digital Woes*, can’t help but fail. Sometimes this is just annoying, and sometimes we don’t even notice. But sometimes the repercussions can be

■ Creative Computing

If you think *creative computing* is an oxymoron, you may change your mind after you read what educator and landscape architect Mark von Wodtke has to say in *Mind Over Media: Creative*



Thinking Skills for Electronic Media (\$32.95, McGraw-Hill, 800-722-4726; ISBN: 0-07-067633-X). Designed to help readers discover more creative ways of using electronic media, the book uses a “don’t fight it, master it” philosophy to bring readers to what von Wodtke sees as a new Renaissance brought about by computer literacy. This is a stimulating, attitude-changing book.—NJS

serious, costing somebody a lot of money or even a job.

Wiener lays the groundwork for her argument that there are times when we should not depend on software by explaining how it is developed and works. “Writing software,” says Wiener, “is a subtractive exercise” with “the need to prevent every contingency you do not design.” Thanks to market and time constraints, bug testing is chiefly done by the customer.

Wiener points out that critical systems—systems run by software that must work correctly as soon as they are put into service or potentially yield disastrous results—are increas-

ingly prevalent, and we who may be affected by the failure of these systems should have a say in their use. The author also reminds us that while proposals for computer technologies may be infinite, funding is not.

Digital Woes isn’t all negative. Wiener suggests ways to improve software development, strategies for coping with software failure, and how to assess technologies before embracing them. Two places she would like to see computer technology used more: education and government. Wiener’s style is



conversational and appealing, with well-documented references that make *Digital Woes* a compelling and worthwhile read.

► **Electronic Invasion: Brave New World of Business Communications**, by Cheryl Currid, \$26.95; Brady Publishing, 800-428-5331. ISBN: 1-56686-085-7

Circle 444 on reader service card

► **Digital Woes: Why We Should Not Depend on Software**, by Lauren Ruth Wiener, \$22.95; Addison-Wesley Publishing, 617-944-3700. ISBN: 0-201-62609-8.

Circle 445 on reader service card

Read Only Recommends



Did someone say DOOM? It seems these days that everybody is saying and playing DOOM, the game from id Software that has taken over the desktop of many a late-night PC gamer. Robert E. Waring’s *DOOM: Totally Unauthorized Tips & Secrets* shines a light on DOOM’s scary nooks and crannies, making it a lot easier to sleep at night. \$9.95; Brady Publishing, 800-428-5331; ISBN: 1-56686-187-X.



These days, all it takes is a little success to overload your business. The more you demand of your computers, the slower things can get. Well, that's because PCs are made to be PCs. And at this point, what you really need is a server—the most efficient way to get your PCs working together.

So we'd like to introduce you to the Compaq ProSignia VS. Now, for the price of a desktop, you can get a real, industrial-

strength server made by the company who knows the technology best. (Compaq is recognized as the world leader in servers.®)

Unlike a PC, the ProSignia VS is specifically designed for the job of powering a computer network in small- to medium-sized businesses. It's optimized for high-speed file transfers, to eliminate the finger-tapping during everyday tasks, like calling up a customer record to take an order. It also expands easily to



NOW THAT YOUR BUSINESS IS GETTING
A LITTLE BIGGER, GUESS YOU'LL
BE NEEDING AN OFFICE MANAGER.



provide vast, centralized storage as your business grows larger.

And while most servers are complicated, the ProSignia VS can make your life easier. Our optional CD-based SmartStart simplifies the whole process of setting up a reliable system. And Insight Manager (also an option) keeps an eye on key parts, pinpointing problems *before* they can disrupt operations.

Of course, the ProSignia VS also provides the security of

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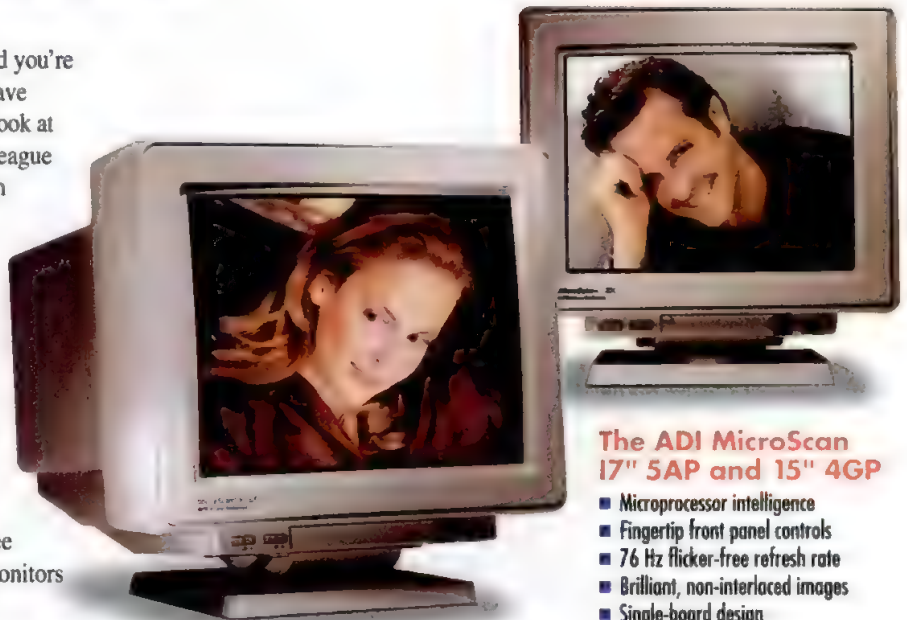
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Michael J. Miller

Editors in an Electronic World

How do you know this is an opinion column? If you're a regular reader, you already have some idea of the kinds of topics I write about. But even if you've never seen *PC Magazine* before, the layout, the typography, and the photo on the top of the page

provide visual clues that tell you this is an opinion column, not a news story. As we move into the electronic world of on-line services and CD-ROMs, many of these clues will no longer exist. The result will be a new world with new responsibilities for writers and editors—and for readers.

FACT VS. FICTION

In most print magazines and newspapers, it's relatively easy to understand what kind of information you're getting. Stories are clearly meant as news, features, or opinions, and their formats are distinctive.

In other media, the dividing line is a little fuzzier. How many "infomercials" that look just like news shows have you seen? In some of the new electronic media, story headlines, illustrations, placement, and sizes are often very different from what readers have grown to expect. In many traditional on-line services and CD-ROMs, they're missing altogether. This makes it vitally important that information providers make it abundantly clear when the information they are providing is meant to be fact, and when it is meant to be opinion.

It's even truer when you think about photographs. We've all heard the old saying that "pictures don't lie," but in the digital world, they lie all the time. Just a decade ago, *National Geographic* got in trouble for digitally moving a pyramid so that the image would fit in a cover photo, but that was done on a fairly expensive, fairly esoteric computer.

Today, thanks to the emergence of better and cheaper scanners, digital cameras, and great photo-editing packages like Photoshop, PhotoStyler, and Picture Publisher, anyone can change an image. What do you end up with? How about *New York Newsday's*

front-page photo of Tonya Harding and Nancy Kerrigan skating together at Lillehammer a day before they actually shared the same ice. Yes, the fine print said it was a composite, but who reads the fine print?

The same thing happened recently in the O.J. Simpson case. *Newsweek's* cover had a straight mug shot with some type and a logo over it. *Time*, on the other hand, started with the same photograph but turned it into a darker "photo-illustration." Is that making an editorial judgment? You better believe it is.

In *PC Magazine*, when you see screen shots of applications or photographs of PCs accompanying reviews, you can be sure they are actual programs and actual PCs. But we do enhance images for the covers, often making systems stand out a bit more clearly, and we sometimes run idealized images, such as the illustration of the "perfect PC" in our July issue. We try to make it clear by position and by identification which photos are meant to show actual products and which are meant to be illustrative.

Imagine what's going to happen when the technology for editing and manipulating video becomes easier, cheaper, and more widespread. Today, we have Elton John chugging Diet Coke with the late Louis Armstrong.

Tomorrow, anything will be possible.

NEW KINDS OF EDITORS

One thing is clear: We'll have more information available to us, in more forms than ever before. The rapid growth of CD-ROM publishing, on-line services, and the Internet is going to connect us to all sorts of information.

Consider the controversy about some of the contents of the recently published *Haldeman Diaries*. The quotations in question aren't even in the print version of the book; they're from the unedited version of the diaries, which is



The on-line world is full of information. It's up to you to figure out what kind of information it is.

Michael J. Miller

available only on CD-ROM.

That's only the tip of the iceberg.

Just as political junkies can now turn to sources such as C-SPAN instead of getting information distilled through the traditional media, more raw information of all sorts is becoming available via CD-ROM and on-line services. It will be much easier to publish information in the new electronic world; putting things up on the Internet or an on-line service is much less expensive than paying to have a book printed.

As a result, we'll all have a lot more information in this brave new world, maybe too much raw information. No one can possibly search all the sources that will be available. Remember that the collected works of Shakespeare fit easily onto a single CD-ROM, with room left over for another several hundred books.

One answer will be the development of intelligent "agents," which hunt through news and information sources to find the things we're interested in. This will certainly

ly help, but it's not going to be enough.

The role of writers and editors who synthesize, analyze, and report will remain crucial. Sometimes you may want to read a collection of speeches and comments made on a particular issue. Sometimes you'll be content with a news story or an analysis based on those speeches and comments. Sometimes you'll want to ignore it altogether. It all depends on how much interest you have and how much time you're willing to invest.

That's why journalists will need to continue their traditional role of finding and interpreting the news. But with all sorts of information available, the role of the media as a gatekeeper is going to change dramatically. In addition to shaping stories, more and more editors may take on the new roles of directing people to information and moderating discussions.

Whether they're editors or librarians, people who collate information will be in demand. Bibliographies at the end of a book, which today are often ignored, will become hypertext links to more information.

"Information everywhere" is the mantra of the new connected electronic world. Exciting opportunities abound for both journalists and readers, but not without challenges—among

them, the technology itself, as well as the methods and ethics associated with using it.

TALKING BACK

If you want to discuss things further, you'll be able to contact editors and writers via on-line services and perhaps take part in an electronic discussion with other people who share your interest. This has been true of computer magazines for a long time, as you know if you've ever visited the PC MagNet section of ZiffNet on CompuServe. Now, with many publications going on-line, such electronic discussions are getting more prevalent in the general press.

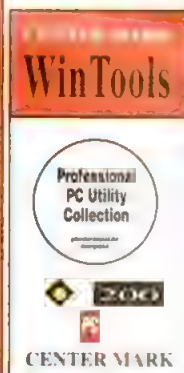
You shouldn't overlook the importance of "editors" in designing these kinds of electronic forums and of moderators in making sure these discussions make sense. The moderators have to walk a fine line between encouraging discussion and keeping the conversations on track.

As writers and editors, we need to be clearer than ever about what kind of information we're giving our readers. And as readers, we all have to be more aware of the potential for misuse and misunderstanding—even as we marvel at the richness of available information. □

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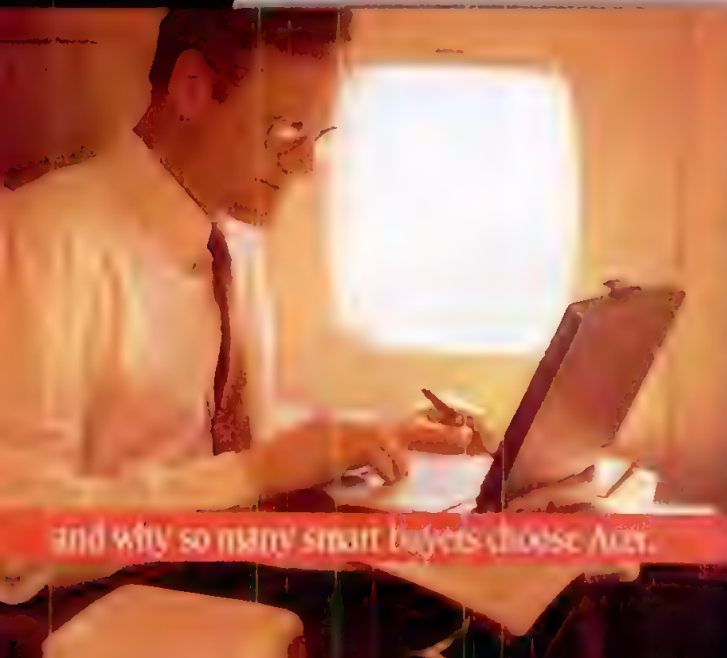
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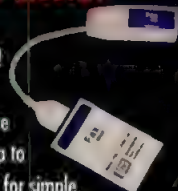
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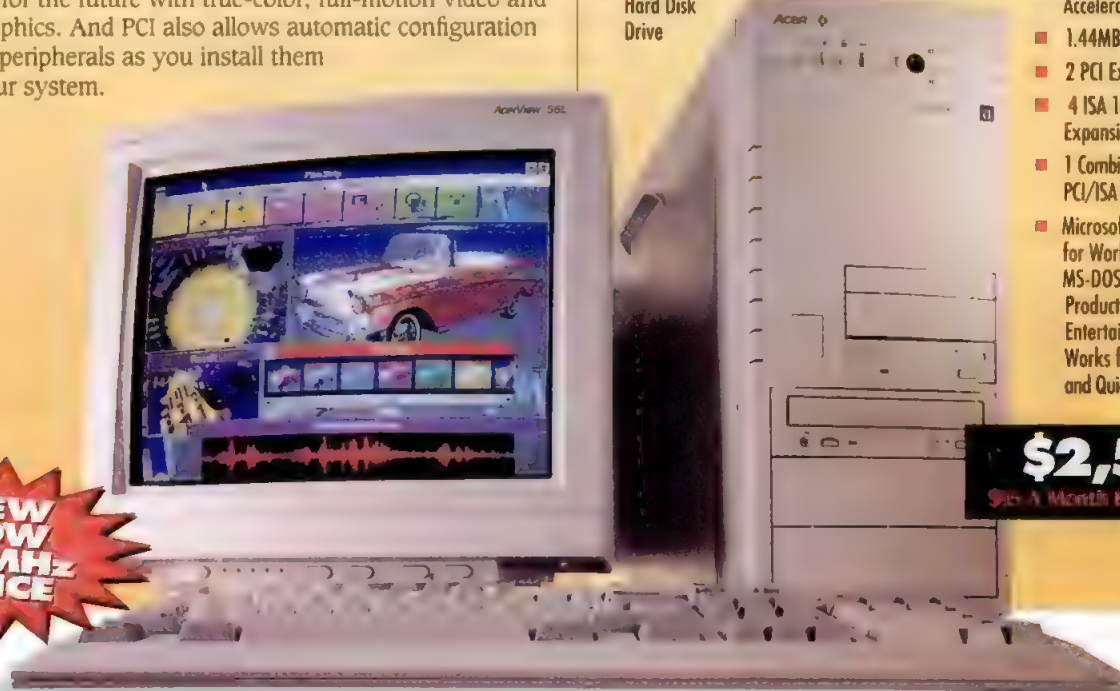
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CIRCLE 224 ON READER SERVICE CARD



Bill Machrone

The Decade Ahead

My 12-year-old daughter and I were taking turns lying on the front lawn recently. We were squinting up at the top of a tree through a sort of sextant/bevel protractor she had made with cardboard, string, a paper clip, and a soda straw. Our goal was to

measure the height of a tree using sine tables and some measurements along the ground.

That got me to thinking about how the next generation of computers might help us solve the problem. Today, we have two choices in putting Pythagoras to work. We can write a procedural program using BASIC or whatever language we're handy in or use the transcendental functions in a spreadsheet to get the job done. In either case, you need to understand the underlying theorem; be able to identify the information you have at hand as the angle, the tangent of the angle, and the length of the adjacent side; and have the rudimentary math skill to solve for the length of the opposite side.

Fast-forward ten years. Now imagine a computer with ten or a hundred times the processing power of one of today's machines. It could have a hundred times the storage capacity, too. Tens of gigabytes of storage won't be unusual. It might have somewhere between 256MB and a gigabyte of RAM. One of the several modes of input would be a touch screen or stylus. Suppose for a moment that the power of the system wasn't utterly gobbled up by the operating system and that some of the power was actually available to you, the user. Think of what you could do.

Our little trigonometry problem, for example. We could describe the problem to the system by drawing a crude sketch on the touch-sensitive screen. CAD programs already exist that turn rough sketches into cleanly drawn objects. The same technology could give us a clean rendering of our tree, the measurements on the lawn, and the angle we'd measured. Then all that processing power could go to work. A truly smart system could recognize the right triangle at the heart of the problem and solve for the things we don't know

based on the things we do know.

That machine would be as good at readin' and writin' as at 'rithmetic. By then, lexical analysis will be just another service provided by the operating system. You'll be able to tell the machine what to do and when to do it, or you could just send it a note. The same logic that understands your spoken and written commands will straighten out your tangled syntax, get your tenses and cases right, and set the tone of your writing. Good handwriting will never return as a valued skill, but the prevalence of e-mail has brought good writing back into focus after the telephone nearly killed it. Advanced lexical analysis will make all of us good—if not great—writers.

With a complete dictionary and linguistic rules on-board, the machine would be capable of many other feats, such as functioning as a voice typewriter that handles continuous speech. Add another language's dictionary and rulebook and you'd have simultaneous translation of text or voice. Not only could you converse in e-mail with people in foreign countries, you could have phone conversations with one- or two-sentence delays, much like those with a human translator.

Today's computers are surprisingly bad at speech synthesis. Considering how long it's been since Texas Instruments introduced the Speak-and-Spell, we haven't made a whole lot of progress. Voices are unnatural, as are pacing and inflection. Today's software pauses at a comma, drops the pitch at a period, and raises pitch at a question mark. Big deal. Too much still sounds like the tinny, mechanical voice on the shuttle train at the Atlanta airport ("Please-move-to-the-center-of-the-vehicle-and-away-from-the-closing-doors.") You'll know speech synthesis has arrived when your computer can



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Bill Machrone

read a book or magazine article to you and you'll actually be able to focus on content instead of the robotic sound of the voice. You'll know things are *really* good when the computer can read fiction to you, using different voices for each character.

Researchers are working on inflection as we speak. The trick is to analyze enough of the content to recognize words that people commonly emphasize, dependent clauses (where you drop your pitch and volume slightly), and phrases that are set off by small pauses, but without commas. Researchers at IBM's Human-Centered Computing lab in Austin, Texas, recently built Bill, the Amazing Mail Reader—an application in which a cartoonish likeness of me reads e-mail messages aloud. It was a form of revenge, I suppose, for my critical comments about Charlie—one of their other on-screen human faces. I'm told that Bill is learning inflection, but I haven't heard the results yet.

The upshot of all these ambitious software projects to make computers more friendly is that the CPU will never be fast enough. As the graphical content becomes richer and there are more colors on the screen, the processor works harder. Likewise, we're moving towards implementation of just about every API known to humankind, as well as extensive use of emulators to run entirely different operating systems simultaneously. The goal is never to have to say no to the user—to make any code, from any machine, run at any time. That'll be a long time in coming, and it's going to chew up considerable machine resources.

I believe that all of the above will be accomplished over the next decade. At the same time, communications will become ubiquitous. All machines will communicate through voice, video, and data with all other machines. Electronics will be so miniaturized that the main determinants of a machine's size will be the size of its display and its keyboard—if it has one.

These machines will do so much that they'll utterly change the way we think about education and the nature of knowledge. Where does it end? It doesn't. We haven't even mentioned the potential of neural technologies and visual recognition. Imagine walking up to a machine and having it greet you by name because it recognizes you. Maybe not in the coming decade, but surely the next. □



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John C. Dvorak

DOS Is Alive, and, Well...

The report that came over the business wire wasn't totally unexpected. It read: "Despite the popularity of Microsoft Windows, a new survey indicates that six of the top ten most widely used software applications for both home and corporate use are

DOS-based, including the three most popular home applications." If DOS is dead, then it's the liveliest corpse I've ever seen.

The research, which came from Computer Intelligence InfoCorp's Consumer Technology Index, 1994 (CTI) survey, found that WordPerfect for DOS was the number one application for both homes and large businesses. In fact, the top ten applications in use at home are (1) WordPerfect for DOS, (2) Printshop for DOS, (3) Lotus 1-2-3 for DOS, (4) Microsoft Word for Windows, (5) The Norton Utilities for DOS, (6) Quicken for DOS, (7) PC Paintbrush for DOS, (8) Microsoft Works for Windows, (9) Quicken for Windows, and (10) WordPerfect for Windows.

In the corporate arena at companies with over 1,000 employees, the top ten applications are (1) WordPerfect for DOS, (2) Lotus 1-2-3 for DOS, (3) Microsoft Word for Windows, (4) Microsoft Excel for Windows, (5) dBASE for DOS, (6) WordPerfect for Windows, (7) The Norton Utilities for DOS, (8) Lotus 1-2-3 for Windows, (9) Harvard Graphics for DOS, and (10) Microsoft Word for DOS.

The report goes on to state that 45 percent of all DOS users will *not* switch to Windows. It's interesting to note that large corporations seem more Windows-oriented than the home market. This makes me wonder about the sudden promotion of the new multimedia-crazed home market, which looks more like a conservative meat and potatoes audience to me.

Anyway, the situation is more complicated now that all signs point to a future DOS with even greater appeal. Microsoft has announced that MS-DOS 7 will incorporate multitasking and some other new features planned for Chicago

(a.k.a. Windows 4). IBM says that it, too, will produce a fancy, multitasking PC DOS 7.

The over-promotion of Windows products at the retail level gives a false impression of the market. For over a year, DOS vendors have been complaining to me that they can't get shelf space in computer stores, though they sell upgrades effortlessly into their installed base through the direct sales channel. The true software market is dominantly DOS, and there may be no end in sight.

The appeal of the command-line interface cannot be overlooked. Though DOS takes a few moments of study, it can be a powerful tool once learned. DOS power users are the first to find solace in the OS/2 VDM (virtual DOS machine), where they can use OS/2's REXX programming language and do other chores that are mouse-free.

Sure, there are plenty of practical reasons to use a command line, but few of them make up for the power achievable by a graphical user interface (GUI). You know the power of sitting at the office computer surrounded by bug-eyed novices staring at the screen and gasping in awe as you type in a series of arcane commands. The command-line interface is a vestige of an era of macho computing. The original split between PC users

and Mac users was a battle between the masculine command-line interface and the girlish GUI. Look at the Unix world. How many real Unix hacks actually use Motif (the Unix GUI) instead of the command line? Few. Motif is used by outsiders—wimps. In fact, the word *wimp*, for many, means Windows-icons-mouse-pointers.

DOS has a basic appeal and is unlikely to die. I even expect to see command lines as an option on the PowerPC. I guess in some situations the command line will come in handy. At least, that's what I'll tell the kids.



The command-line interface is a vestige of an era of macho computing.



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Inside Track

T

he **best place** in the world to catch up on gossip and current hi-tech debates is the Grand Hyatt Hotel in Taipei during **Computex, Asia's biggest computer show**. A hotbed of **odd ideas**, wild innovation, and **wacky** experiments, it's a genuine trade show for computer manufacturers, so attendance gives you a good perspective on what's ahead for the industry in the next few years. That's why I go to Computex rather than Comdex.

This year's show was **no exception**. There was even **action** with the lowly keyboard. One vendor had an experimental wireless keyboard that used radio frequency instead of infrared. He'd roam all over the place to prove its worthiness. Seemed like a good idea. I was **most impressed** with Syncon Corp.'s **totally waterproof** keyboard. The vendor had it in a **tub of liquid** into which you'd put your hands to type. An excellent idea that replaces those clumsy plastic keyboard covers. Contact the U.S. office at 818-856-5160. The price for the waterproof keyboard is **\$12.50 per keyboard**, when purchased in quantities of 20,000 units. You'll pay about \$100 after all the middleman markups. (They hate it when I print this stuff.)

Other Keyboards Dept.: If you want to import a terrific (not waterproof) keyboard (and my favorite), **get the Focus Keytrack** with its built-in trackball from Focus Electronics. This is one nice keyboard. **Looks good, feels great**. Contact the U.S. agent at 909-468-5533 (phone) or 909-468-5525 (fax). If you can't buy one that way, ask how you can. Another good keyboard idea comes from the Tysso Group in Taipei (phone: 886-2-7586936; fax: 886-2-7586041). The PKB-1020 PC-POS keyboard has a **built-in magnetic-strip-card reader** and built-in bar-code wedge. Perfect for terminal security or point-of-sale systems. This is the keyboard many video rental places are starting to use.

Mice on a Roll Dept.: Mice are another mainstay of the Taiwanese. I liked A4 Tech's new WinMouse, which can stand up on end and be used as a two- or three-button mouse. Call the U.S. contact in Walnut, California (phone: 909-468-0071; fax: 909-468-2231). The **most spectacular** mouse from Taiwan is New Idea Electronic's (phone: 886-2-705-7576; fax: 886-2-7050795). The Beetle Mouse **looks like a bug**, and the newest version is painted to resemble a **huge ladybug**. The company also has a weird standalone trackball, the Legend Ball, which you have to see to appreciate.

Wow! All the disk-drive makers showed up at Com-

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catch up on

industry gossip

is at the Grand

Hyatt in Taipei

during Computex.

The show is a hotbed

of wild innovation

and hot technologies.

putex with their latest technologies. Most **stunning** was IBM's magneto-resistive (MR) head 2.5-inch 810MB hard disk. Look for this in the next generation of ThinkPad notebooks. The MR-head technology is forcing all the drive makers to up the ante. You can be sure that we'll all be running gigabyte hard disks shortly. The IBMer working the booth said this diminutive 810MB disk will soon double in capacity to **1.6 gigabytes**. This is a 2.5-incher, folks, with three small platters. **The whole disk is only 17 mm high!**

Meanwhile, all the Taiwan notebook makers have a new line of low-voltage **90-MHz Pentium notebooks** they're anxious to produce. Many use the new Duracell standard

batteries that you'll be able to buy in airports. You might consider this new battery idea when buying a notebook.

Bummer Dept.: There was little new in desktop systems. At last year's Computex, there was a lot of experimentation with **colored cases**. Purple, red, and yellow boxes were the rage. It was a **trend that died overnight**, since the staid U.S. market refused to bite on anything other than **beige or light gray**. A **pathetic indictment** of our conservative, almost **fearful**, rejection of flair. I was disappointed. This year, there were only spots of color, such as lavender turbo and reset buttons on an all-beige machine.

One cute idea from K.A. Chen International (phone: 886-2-3655998; fax: 886-2-3671695) was a PC case that had a place for a 3- by 5-inch or 4- by 6-inch color photograph of your **loved one** (baby, wife, cat, dog, whatever). It's called My Favorite Case and looks like a winner for homebrew clone builders who have a **sentimental** bent. The company also produces a device called the Sound Box, which slips into a 5.25-inch floppy disk drive bay. It consists of a small audio amplifier with two dinky speakers—a **novel idea** that the company patented.

Chip Wars. The most interesting aspect of this year's show was the apparent **battle now brewing** between the Pentium and the PowerPC. Almost all the Taiwan clone makers had PowerPC machines up and running (Windows NT, wouldn't you know?) in back rooms. When asked why the machines were in the back rooms, vendors would say they didn't want Intel to find out. The Intel booth and the PowerPC booth **dominated** the scene with everything short of **dancing girls**. The literature bag of choice was definitely the giant PowerPC bag that everyone carried around.

The future success or failure of the PowerPC will become **obvious** at next year's show. So far, it looks good—but so did those colored cases last year. □

WIN

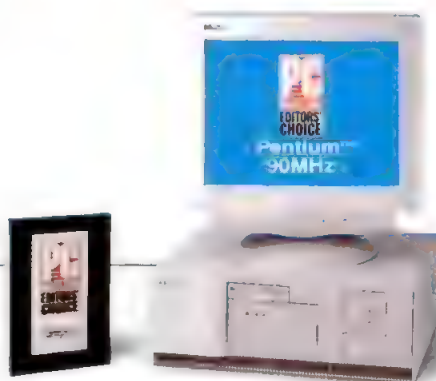
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We also moved the operator panel to the PC screen — where it belongs. That way graphical displays and animated icons can show you exactly what's going on at all times.

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Jim Seymour

Pretty Good CD-ROMs

The explosion of CD-ROMs continues. Print publishers think they have to be in the CD-ROM business, or they'll miss the boat. (Correct.) Hollywood producers and wanna-bes think they hold the key to CD-ROM success and will make their next

mega-millions there. (Dubious propositions, both.) And *content specialists* of every sort—from lonely college professors to amateur experts in remarkably obscure fields—see CD-ROM publishing as their chance to cash in finally on their heretofore underappreciated expertise. (Warning: Disaster ahead.)

It's clear that hardly anyone has a clue as to what will and won't work, and sell, in CD-ROMs. We're still in that early stage of market development in CD-ROM publishing where the operating principle is "Throw something out there; maybe it'll succeed." Ten years from now, when we look back on these chaotic days attending the birth of the CD-ROM business, it will be oh-so-clear what was and wasn't destined for success. Today, who knows?

Elsewhere in this issue you'll find our nominations for the 100 Best CD-ROMs. We invested a lot of time and energy in researching and wrangling over the story; I've been tempted to publish our collected e-mail messages as a bootleg CD-ROM itself. The story also includes a look at Bill Machrone's personal favorites and John Dvorak's *bêtes noires*.

But there's yet another category of CD-ROMs we should examine: stuff that is neither hot enough to make a mainstream 100 Best list nor horrible enough to make a Worst Ever list, but nonetheless funny enough, or useful enough, or maybe just improbable enough, to make my ever-changing "Darned Interesting Even if Not Really Great CD-ROMs You Probably Shouldn't Miss" list.

Some of these titles have only DOS interfaces, and often not very good ones at that; many won't run reliably in a DOS box under Windows, requiring you to exit Windows first; some do weird (but ultimately innocent) things to your hard disk and boot files; others

are clearly only for the committed (or maybe, those who *ought* to be committed); many are hard to find. But worth the trouble.

• **PC Karaoke: Elvis the King** (Sirius Publishing). Just what it sounds like. If there's a little of the King in you (or you wish there were), throw good judgment to the winds and boot this up. But please, close the door first so no one is forced to listen to you. And don't send me home videos of the results.

• **Monarch Notes for Windows** (Bureau of Electronic Publishing). You cruised through school on them, then swore off them forever. But don't you owe it to your kids to give them an...umm...educational advantage like this? Seriously, this puts 200-plus Monarch Notes on one CD-ROM for a bargain price. Think of it as Book Report City. And of course, it's still a rich resource for the cocktail-party raconteur.

• **Books Out-of-Print** (Bowker Electronic Publishing). Bowker's Books in Print series is well known, on CD-ROM as well as in traditional book form. This virtually unknown disk is often much more useful, since it allows you to find items that have fallen off publishers' backlists and can no longer be found on bookstore shelves.

• **Picture Atlas of the World** (National Geographic Society). Sure, you have that CD-ROM encyclopedia that came bundled with your multimedia upgrade kit. But encyclopedia users need an atlas, too—and a good one. The Geographic's CD-ROM Mammals is well known, but this one languishes in obscurity. It also wins the prize for the year's oddest list price: \$143. Get it; you won't regret it. Trust me.

• **CD-ROMs in Print 1994** (Mecklermedia). Is this too self-reflexive? I don't think so. What more logical medium for searching for a CD-



Sometimes the most noteworthy CD-ROMs are neither the best nor the worst, just the most amusing.

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CIRCLE 008 ON READER SERVICE CARD

Jim Seymour

ROM on some obscure topic than a CD-ROM itself? This one is issued twice a year, so it's reasonably current.

• **Distant Suns** (Virtual Reality Laboratories). The best planetarium-on-your-desk program I've ever seen. Beautiful for anyone interested in the night sky; essential for amateur astronomers.

• **Karaoke Shakespeare: Macbeth** (Multi-media Publishing Studio). Wanna be a witch? Maybe the Lady herself? Here's your chance; break a leg.

• **Hollywood the Bizarre: Lives and Deaths of the Stars** (ScanRom Publications). With a title like that, what more need I say? The feats and fates of 5,000 movie stars, in more detail than you could imagine. A necrophiliac's delight.

• **Loon Magic** (Wayzata Technology). If you grew up in the northern latitudes, listening to the loons on the pond at dusk (or maybe attended summer camp on your own version of Loon Lake), this will break your heart. There's even a separate, simplified kids' version on the same disk. Listen, read, blink away a tear, let your thoughts drift back to those lazy, hazy, crazy days. . . .

• **Fat Cats** (Aristotle Industries). Remember a few years ago, when John Aristotle Phillips, a Princeton graduate student, received *lots* of attention for describing how to make a perfectly serviceable nuclear bomb using common household items? Ever wonder what the second act is in a life like that? The secret's out: John is living in Washington and publishing CD-ROMs of campaign contribution records filed under Federal Election Commission requirements. My favorite of these disks is *Fat Cats*, a compendium of every political action committee and individual who has given \$200 or more to a candidate for Federal office since 1986. Ever wonder whom Robert Redford supports? Do you want to know who Donald Trump's pet pols are? They're all here—and then some.

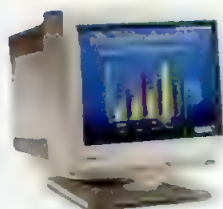
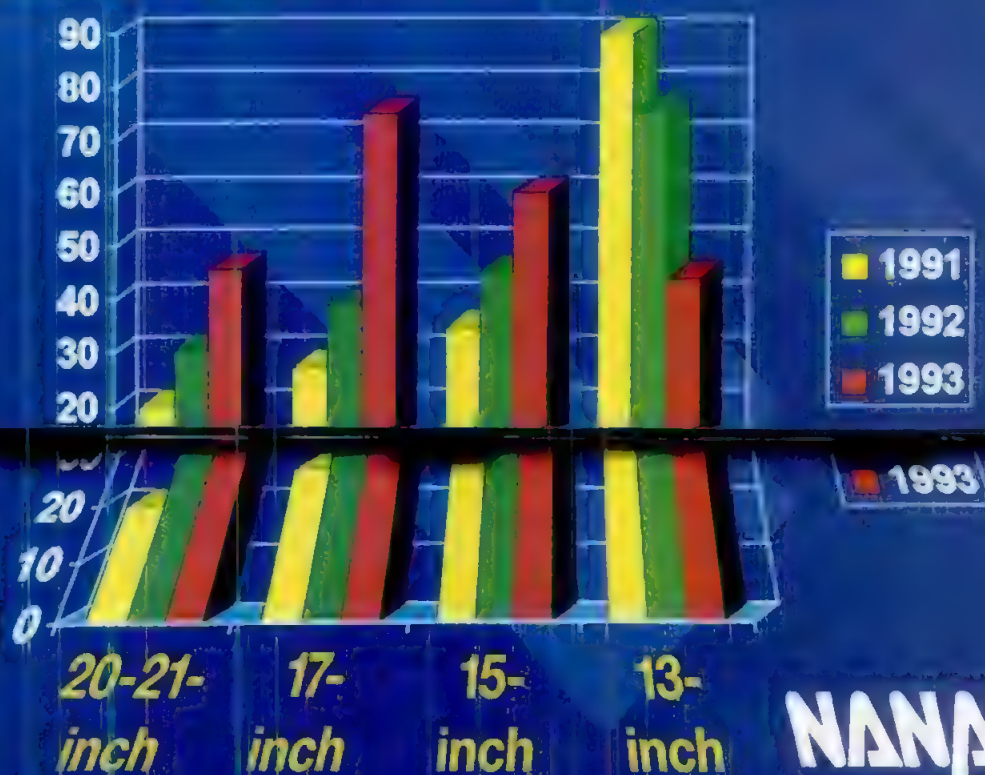
• **Dr. Schueler's Home Medical Advisor** (Pixel Perfect). The most eccentric CD-ROM I've ever seen. This disk moves from very nice diagnostic Q&As to an amazing library of gross-to-the-layman color photos of wounds to videos of barracudas and moray eels. If you figure out what all those underwater videos are doing in the middle of this disk, please send me a note. Fair warning: There will be a suitable prize for the most creative answer. □

100 PC MAGAZINE SEPTEMBER 13, 1994

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CIRCLE 283 ON READER SERVICE CARD

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The Critics Rave

Hardly a month goes by when a Micron PC doesn't pick up a new award or citation: recently, Micron's P90PCI Powerstation earned *PC Magazine's* prestigious Editors' Choice Award and Micron's superb reputation earned them *PC Magazine's* Readers' Choice Service & Reliability award. *Byte*, *PC World*, *Windows Sources*, and others have also cited Micron PCs for technical excellence and exceptional value.



The Editors Marvel

"The system's components and general design dazzled,"—*PC Magazine* June 28, 1994. The P90PCI PowerStation outscored all of the competition—including Dell and Zeos Pentium PCs—in the Winstone 94, Disk Winmark and Disk benchmark tests. This was no surprise, however—in the April 26th issue *PC Magazine* also ranked the Micron P90PCI above all the competition in key benchmark tests.

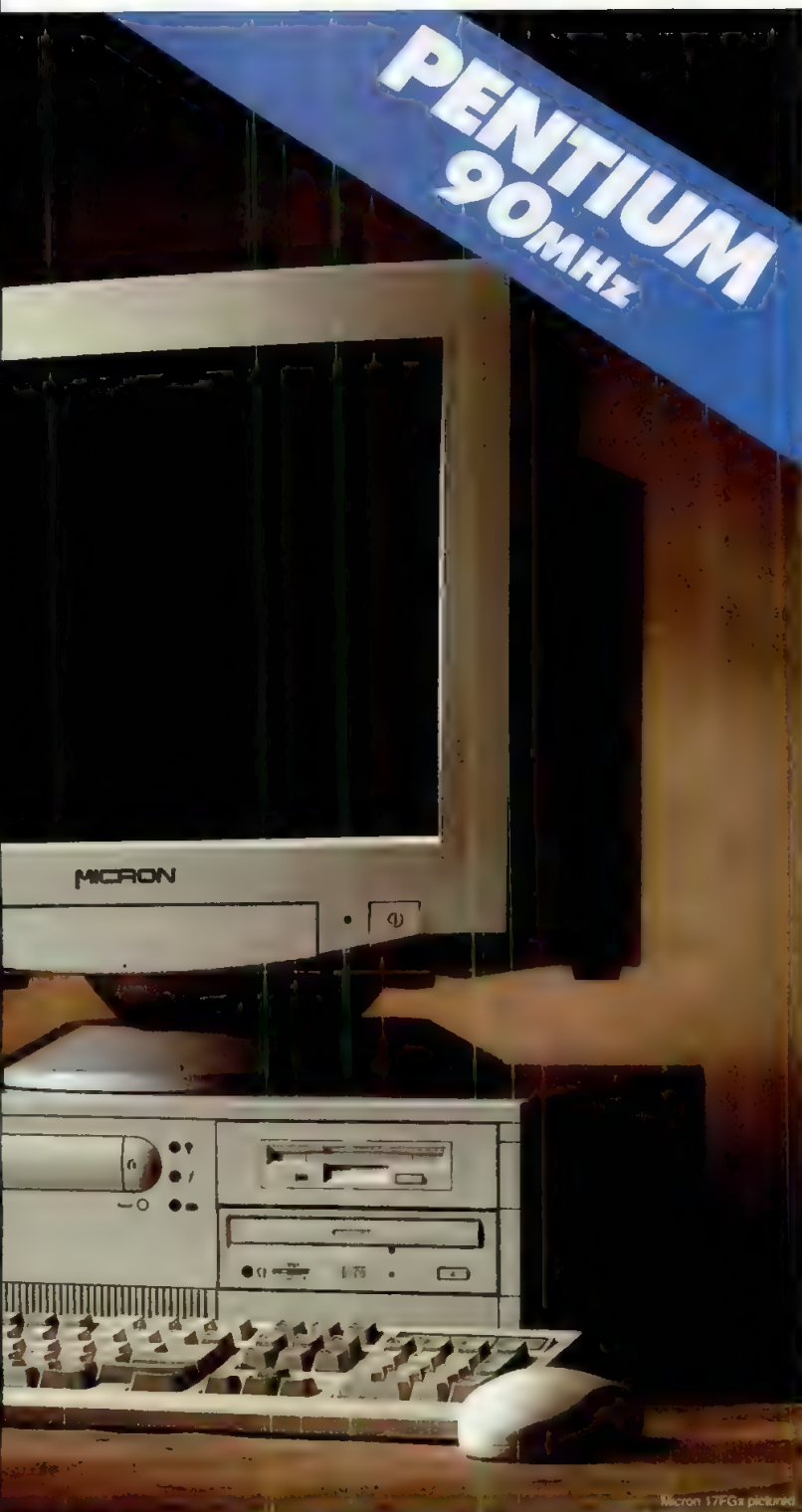
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As a fully integrated manufacturer of semiconductors and components, Micron can offer the latest configurations at the lowest prices, and still provide outstanding customer service and technical support. "If value is paramount, the Micron P90PCI offers all you'll need in higher order computing,"—*PC Magazine* June 28, 1994.

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June 28, 1994
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Powerstation

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PC Magazine 6/28/94

P90PCI Powerstation

- Intel™ 90MHz Pentium™ processor
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- PCI graphics accelerator (2MB)
- Desktop "Tool-Free" chassis
- MS Mouse, 101-key keyboard
- MS-DOS® & Windows® for Workgroups
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- A** • 8MB RAM (expandable to 192MB)
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June 1993



June 1994



June 1994



May 1994



March 1994

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PC Magazine 1994 Readers' Choice Service & Reliability Awards gave Micron the highest ratings in the categories of Overall Reliability, Satisfaction with Technical Support and Future Likelihood of Buying Again.



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As a leading manufacturer of memory chips and computer components for over fifteen years, Micron offers a superb combination of technical superiority and high reliability, then backs its PCs with a knowledgeable and responsive technical support organization.

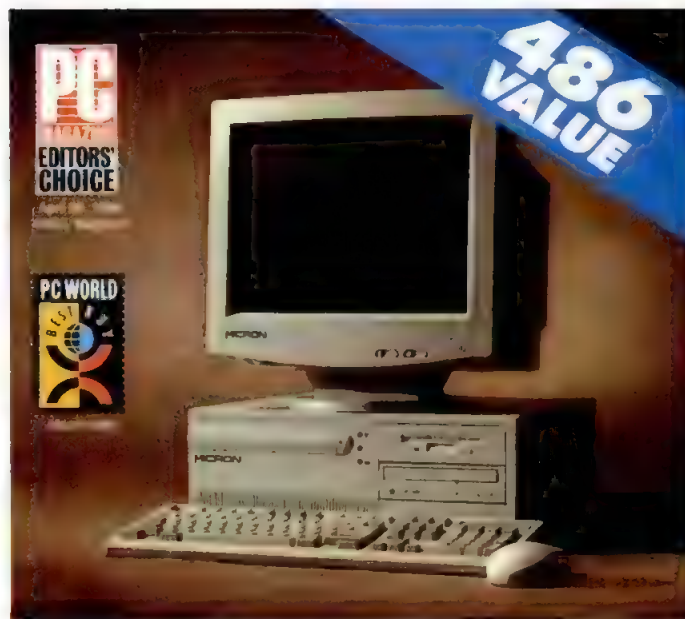
The Intelligent Choice

Smart buyers seek the highest performance for their dollar: "The 466VL came with everything we've come to expect in a high-performance machine," wrote *PC World*. Not surprisingly, Micron customers are more likely to purchase again than any other manufacturer.

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- Intel™ 486SX 33MHz processor
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- "Once in a while a company really hits all the hot buttons for PC buyers."
- "Micron Computer gets high performance from quality components and thoughtful design."
- "The Micron 466VL Magnum CD was easily the best Windows performer."

PC Magazine April 26, 1994

466PCI Magnum

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Bill Howard

Free E-Mail Can Be Costly

Electronic mail is like red wine: It's beneficial in moderation but ruinous in excess. And to speak frankly, we've become a nation of e-mail users badly in need of a 12-step get-well program.

The problem: too many messages, not enough information.

The causes: lousy filtering and organizing tools, free messaging that encourages overuse, and e-mail users who don't know when to say when.

THE FIRST STEP...

I suggest we charge for all e-mail, including the Internet. Move the cost of the Internet from government subsidies (your tax dollars) to direct user fees. Note: If you're paying for commercial access to the Internet, you're subsidizing a private-access provider more than underwriting the Internet infrastructure.

An enterprising Phoenix lawyer distributed messages advertising his green-card service over the Internet because it was cheaper than any other kind of advertising. Internet chauvinists think he's slime; I think he saw an opportunity.

The Internet is a valuable tool in the right hands. For too many users, however, it's an open-ended invitation to waste time on the job or at home because of the all-you-can-eat-for-free nature of the e-mail and the unfettered ability to browse alt.trivia.everywhere. Managers at more than a few companies are terrified of opening up access to the Internet because of what it may do to their staffs. Fine-tuning Windows wallpapers and playing with screen savers pale in comparison to the giant productivity-sucking sound you hear when users log on to the Internet.

I believe internal e-mail should be charged to the user and the user's department—at a minimum, 29 cents a message. Would that the system were smart enough to add punitive surcharges against an abuser's account, a list of which should go into an employee's permanent record. Offenses would include responding within five min-

utes of an original message's posting (the respondent is probably more caught up in his e-mail than his job), excessive use of priority or receipt-requested handling options, and any response amounting to "Right you are, boss, brilliant idea, love it, love it." Barring these surcharges, you have to hope people this stupid never rise in their companies.

...TO HEALTHIER E-MAIL

Ultimately, our salvation might lie in smart e-mail that can sort, categorize, and even pare down our mail. Today's tools are crude. Bill Gates, for instance, has a "bozo filter" to keep down the traffic, but it merely passes along the messages of specified associates; everything else goes into limbo. Not exactly a supersmart filter.

What you want is software that can read and judge mail by its content, but even there I fear abusive users will figure out what "trigger words" will keep a message from being shunted aside. Today, the most you can hope for is a mail system that pulls together message threads and knows (or can be taught) that Subject: Holiday Gathering and Subject: Xmas Party belong in the same thread. You also want the underlying message

structure to be a true database so you can do things like Read All Subject "Information Highway" Since 8/1/94.

E-mail was supposed to facilitate faster decision making and enable telecommuting. Instead, the wires are cluttered with widely broadcast FYI and CYA memos. Many industry insiders who were once the biggest champions of e-mail have now removed e-mail addresses from their business cards and turned over the task of reading e-mail to their assistants. It's time to sober up and kick the gratuitous e-mail habit. □



As message traffic grows, e-mail becomes an end in itself. To restore sanity, let's charge for the Internet.

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When industry leaders coined the term "Plug and Play," they had products like Z-STOR in mind. Z-STOR is so easy to operate, switching the power on and off is all you need to worry about. And it automatically reconfigures itself at start-up whenever you add users or change drives. Plus, with Personal NetWare[™] pre-loaded, the Z-STOR integrates seamlessly into the corporate NetWare[®] environment.

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All this is packed into a chassis that's not much larger than a toaster. Meaning the Z-STOR fits under your desk, on the bookshelf, in the wiring closet, just about anywhere. Another example of how ZDS[™] makes connecting computers, and people, easier than ever.

Oh, one more point. At just \$999,** Z-STOR is easy to own. So call us, and find out why the Z-STOR personal server is the best thing since sliced, well, you know.

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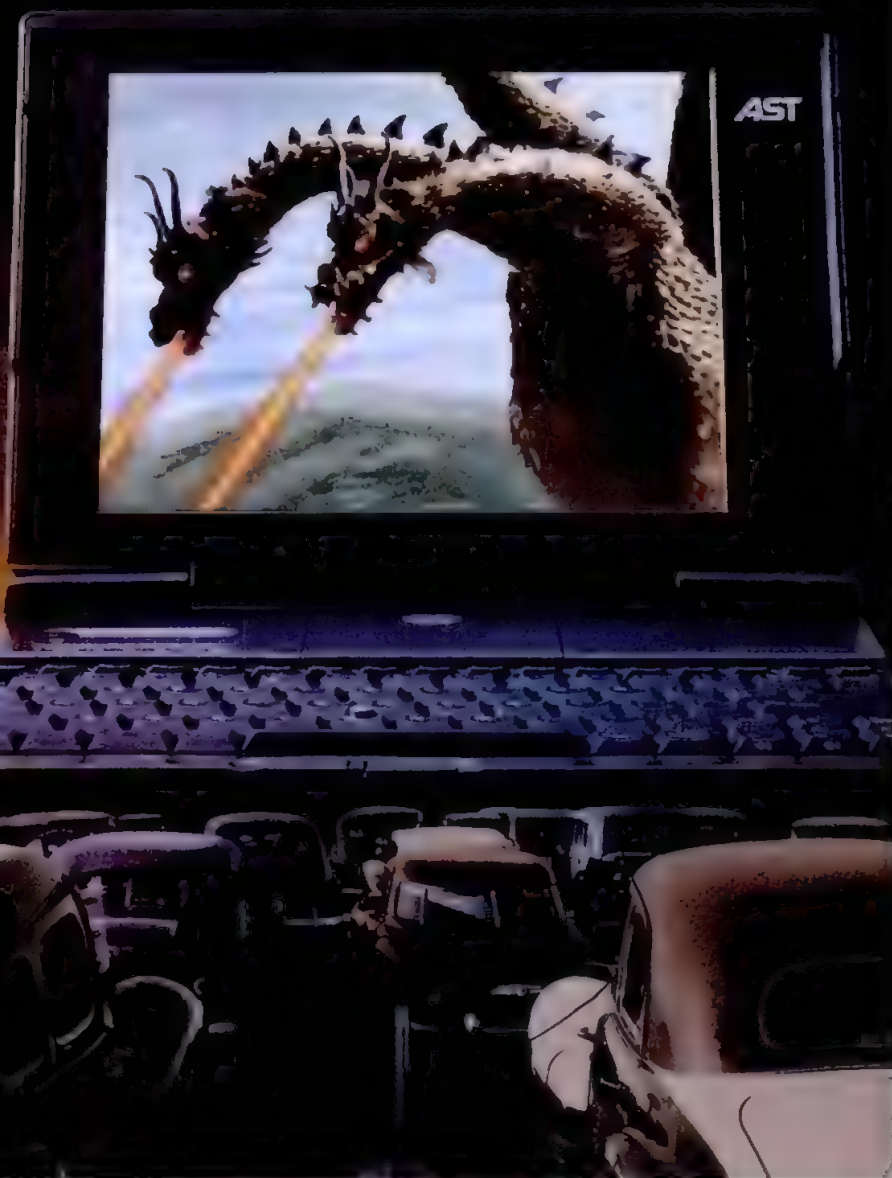


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row in an old Chevy and looked up
at a screen the size of a building has
something looked so striking. This is
one monster screen, with ten and a
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dual-scan STN color. It's the biggest
screen available today.

Your work will dazzle with vibrant
colors, and your audience will appre-
ciate the kind of high definition that
makes the most complex graphics,
even the fine print, quite readable.

Still, there's plenty more to the



processor, up to 75MHz. Local bus architecture combined with hardware accelerated graphics deliver as much as 16 million WinMarks.

Inside, AST's intelligent power management system actually adjusts the computer to your work habits, taking a breather when you do. So the battery life lasts from four to eight hours or about the length of a Godzilla film festival. That's longer than a similar Compaq or Toshiba laptop.

In fact, everything you need to be truly mobile is right here. For instance, the pointing stick is right at your fingertips. There are two PCMCIA slots. Or, if you prefer, you can add a docking station for more expansion.

Of course, there is a three-year worldwide limited warranty,* with a year of 48-hour rapid repair service.** And our telephone support group is here to help you every day, 24 hours a day. It's the kind of responsiveness you'd expect from the fifth largest manufacturer of personal computers.†

You've got to see the new Ascentia 900N notebook from AST. For a screening or more information, please call 800-876-4AST.

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- 4MB or 8MB RAM, upgradable to 32MB.
- VL bus hardware graphics accelerator.
- Two PCMCIA slots, two type II or one type III.
- "Hot swappable" NiMH battery with 60-minute FastCharge.
- Under 7.0 lbs.
- SmartPoint track stick.
- Pre-loaded with Windows and a package of mobile communications software.

	AST 900N	IBM 755C,Cs	COMPAQ LTE ELITE	TOSHIBA T4800CT
Screen	10.4" TFT 10.4" DS-STN	10.4" TFT 9.5" DS-STN	9.5" TFT	9.5" TFT
Battery Life	4-8hrs	3-8hrs	2.5-4hrs	2.5-4hrs
Pointing Device	Integrated Trackstick	Integrated Trackpoint	Integrated Trackball	External Trackball

Intel DX4/75MHz comparable products are N1394. Screen measured diagonally. Battery life from manufacturers' specifications.

900N than just an eye-popping screen. This is very much a high performance notebook, with a powerful Intel 486

YOU'LL LIKE THE WAY WE WORK™

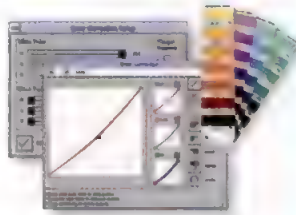
AST.
COMPUTER



Lynne - Graphic Designer :

"Color. I need rich beautiful colors in fine detail. The colors on the screen must match the printer. And speed. When I make a change, I want it on the screen instantly. Nothing less will do. ATT's GRAPHICS PRO TURBO gives me the

best image quality in 16.7 million vivid colors at high resolution 1280x1024 graphics and with superior speed and an easy-to-use color calibration feature."



Precise color calibration



Doug - Power User :

"Only ATT's GRAPHICS PRO TURBO met MY spec! I wouldn't settle for less for my new Pentium computer. It is not just the fastest Windows performer overall: 42M Winmarks with 256 colors and 28M Winmarks in true color. It also

comes loaded with Windows features, such as the ability to instantly switch color and resolution without leaving Windows, and FlexDesk+, an advanced software panel to control color, resolution, desktop and motion video acceleration. ATT's GRAPHICS PRO TURBO has a complete set of drivers for all the other operating systems."



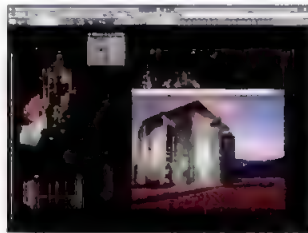
Harry - Architect :

"Detail. My drawings and models have incredible detail. I need resolution so sharp, I could cut my finger on it. Performance and color are critical in both

DOS and

Windows. And, I want a graphics card that will reduce eye strain. ATT's GRAPHICS PRO TURBO gives fast true color at high resolutions under both DOS and Windows.

It comes with fast and feature rich drivers for my CAD applications. After I'm done, I can unwind the day with an exciting game. Only fast DOS performance makes that possible."



True color and enhanced user controls for AutoCAD



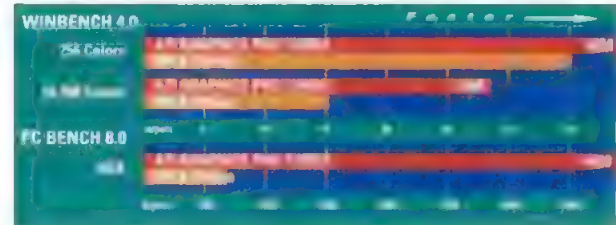
"I knew what I wanted"

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- Fast 42M Winmarks (4.0)
- 16.7M Colors at 1280x1024
- Enhanced Windows Utilities

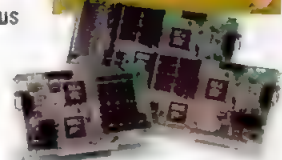
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PC MAGAZINE PICKS

The Top 100 CD-ROMs

With 8,000 CD-ROM titles jamming store shelves, how can you tell the best from the rest? Our guide to today's hottest disks should get you started.

By Lance Ulanoff

More than almost any medium that has come before them, CD-ROMs invite users to get involved. "Take a journey," the boxes invite. Enter a surrealistic adventure "that will become your world." Learn to speak "Power" Japanese. Explore the private world of *♣* (the artist formerly known as Prince). It isn't just hype. The best CD-ROMs can surprise you, inform you, and entertain you.

To help us zero in on the top 100 titles from the thousands available today, we divided them into nine categories: General Reference (dictionaries, ency-

clopedias, atlases); Productivity (tools that help you better yourself or your career, such as business directories, clip-art galleries, and executive information kits); Developers' Tools; Art & Music (music or multimedia CDs, architecture, and art history); History; Science; Entertainment; Edutainment (educational CDs and games with educational value, usually for kids); and Travel.

You'll notice that there are more CDs in some categories than in others. Not surprisingly, games and children's edutainment make up the largest portion of our list. Productivity is a category that appears to be growing, but it offers far fewer disk titles of quality to choose

The Top 100 CD-ROMs

from. There's no question that CD-ROMs are powerful tools for entertaining, enlightening, and disseminating information. But they also contain the software most likely to test the limits of your system. Multimedia CDs, on the other hand—including games, reference CDs, and edutainment CDs—often require that you modify your

FEATURES PLUS

Download the 100 CD-ROM reviews in this feature in a searchable Windows Help format from ZiffNet. Type GO EDITOR and search on CD100.ZIP.

AUTOEXEC.BAT or CONFIG.SYS files (or both).

Instead of offering an overall rating for each CD, we broke the ratings down into categories (see the sidebar "How We Rated Our Top CD-ROMs"). Some CDs did well in multimedia but ran into trouble with resources; others excelled in terms of content but didn't offer much in the way of a user interface. The results simply prove

that, on the whole, CD-ROM technology still has room for improvement.

If that's so, why is 1994 the year of the CD-ROM? You can thank a confluence of factors, including the arrival of triple- and quadruple-speed CD-ROM drives, the continuing PC-price plunge, the sale of more multimedia-ready PCs this year than ever before, and the realization of more and more PC users that multimedia isn't some form of voodoo after all.

According to Glenn Ochsenreiter, managing director of the Washington, D.C.-based Multimedia PC (MPC) Marketing Council, between 5 and 6 million multimedia PCs were installed by end of 1993. The council predicts that that number will double by the end of 1994. The CD-ROM publishing industry must be paying attention. InfoTech, a market research firm that covers the CD-ROM industry and is based in Woodstock, Vermont, reports that there were over 8,000 CD-ROM titles in print as of 1993. InfoTech

How We Rated the Top 100 CD-ROMs

To select the best CD-ROMs from a cast of thousands, we used a simple rating system. Each review is followed by four icons representing different areas, and each icon contains a numerical rating.

We rated the top 100 CD-ROMs on a scale of 1 to 4, where 1 = *poor*, 2 = *fair*, 3 = *good*, 4 = *excellent*. An N/A rating indicates that the product does not have multimedia capabilities.

expects that we'll have more than 13,000 titles to choose from by 1995.

As PC manufacturers sell systems with everything already plugged in, they usually do the compatibility legwork as well. These multimedia-ready PCs are usually MPC-compliant systems. To meet MPC Level 2 specifications, a system must have at least a 25-MHz 486SX processor, a 160MB hard disk, a 16-bit sound card (including eight-note synthesizer and MIDI playback), MIDI I/O and joystick ports, and a 300-kilobyte-per-second double-speed CD-ROM drive that uses no more than 60 percent of the system's processing power for data transfer.

There's a good chance that if you buy an MPC2-compliant CD-ROM and pop it into your MPC-compliant system, it will run without a hitch, but there are other tools that can help you run your system and CD-

ROMs successfully.

- Helix Software (800-451-0551, 718-392-3100) has released Multimedia Cloaking software that uses the technology employed in its NetRoom memory manager product to free up lower-memory space that's clogged with drivers for your mouse, CD-

ROM drive, and disk cache.

- CD Essentials is a Windows-based utility, from Phoenix Technologies (617-551-4000), that will automatically catalog your CD-ROMs and load a CD as



Content. To fare well in this area, the CD-ROM must fulfill the mission stated on its box. If title is "Asia Alive," for example, we expect the eastern hemisphere to come to life. We also consider entertainment value and the overall quality of information.



User interface. Because of the wealth of information and media contained on CD-ROMs,

the user interfaces can be pretty complex. We examine how well an interface guides users through the environment. Installation and setup also figure into this rating.

soon as you place it in the drive bay.

- From Corel Corp. (800-772-6735), CD Power Pak includes software to catalog your CDs, speed up your CD-ROM drive, and record and edit sound files.

- From Individual Software (800-822-3522), Professor Multimedia can teach you about multimedia—for example, about the difference among different types of sound cards and various video-file formats.

Perusing the number of titles available today can be daunting. In fact, there are CDs that contain nothing but lists of all the titles currently in print. Two that proved invaluable in our search for the best and brightest were TFPL Publishing's The CD-ROM Directory and Mecklermedia's indispensable CD-ROMs in Print 1994.

And as the number of titles grows almost daily, so does vendors' understanding of the technology. By the time you read this, it's entirely possible that there will be new CD-ROMs that better utilize your system's resources and provide even more information and entertainment than those available on our list.

General Reference

REVIEWS BY RUBIN RABINOVITZ

Grolier Electronic Publishing Inc.

Grolier Multimedia Encyclopedia

Looking for the best electronic encyclopedia? If *best* means the most accurate and comprehensive, choose New Grolier

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The Top 100 CD-ROMs

**Innovative use of multimedia.**

Thanks to a CD-ROM's unique storage and retrieval characteristics, users often expect to find sound, video, animation, and hyper-linked text on their CDs—regardless of the subject matter. Here we look at the quality of multimedia and how intelligently it is built into the larger design.



System resources. Here we look at how much hard disk space and memory are required to run the given CD-ROM.

Products with relatively poor ratings usually require an inordinate amount of hard disk space and RAM—and that users rewrite their system files.

Multimedia Encyclopedia. This disk is based on the 21-volume *Academic American Encyclopedia*, many of whose 2,300 contributors are authorities in their fields.

This disk boasts 10 million words of text—more than any other electronic encyclopedia—along with comprehensive bibliographies, discographies, fact boxes, and tables. Some 7,000 of its 33,000 articles are new or have been updated for the 1994 edition.

Grolier supplements its text with 4,000 photos and illustrations; 1,000 are new, and most of these are in color. This package also includes 53 video sequences, over 300 maps, 4 hours of multimedia features, and a good search engine. The 5,000-entry time line is linked to the encyclopedia's text, so that clicking on a time-line item will take you to a relevant article.

The latest edition offers 15 animated Multimedia Maps on such topics as the growth of American railroads, the development of the women's suffrage movement, and the progress of the Gulf War. Microsoft Encarta Multimedia Encyclopedia may offer more dazzle, but this encyclopedia provides the most information. \$149.95; Grolier Electronic Publishing Inc., 800-285-4534, 203-797-3530.



Circle 446 on reader service card

Microsoft Corp.

• Microsoft Bookshelf

Connect a search engine to a bunch of reference works and let users retrieve data from a number of these works in a single pass: That's the inspired idea that made

Microsoft Bookshelf a CD-ROM hit back in 1987. The same idea is at the heart of Microsoft Bookshelf 1994 Edition, along with some of the original reference works: *The Concise Columbia Encyclopedia* (15,000 entries and 1,300 images), the *Hammond Intermediate World Atlas* (more than 100 political and topographic maps), and the *World Almanac and Book of Facts* (recently updated for 1994).

New to Bookshelf is *The People's Chronology*, a year-by-year survey of historical, cultural, and scientific events. One somewhat questionable enhancement is the substitution of the 18,000-entry *Concise Columbia Dictionary of Quotations* for the classic *Bartlett's Familiar Quotations*, with its 22,500 entries.

The American Heritage Dictionary now has many more entries, but its operation has become more cumbersome. Roget's Thesaurus is also bigger, with 250,000 synonyms, though many terms are not exact synonyms. Based on the sheer wealth of reference material included, Microsoft Bookshelf 1994 Edition is very much a program worth getting. \$99; Microsoft Corp., 800-426-9400.



Circle 447 on reader service card

Compton's NewMedia

• Compton's Interactive Encyclopedia

If you think the best CD-ROM encyclopedia is the one that's best for kids, get Compton's Interactive Encyclopedia. It's easy to use, and its content—5,200 feature articles and 28,000 shorter articles—is designed to be understood by children as young as six.

A unique feature in Compton's Interactive Encyclopedia is an integrated dic-

tionary: When young readers don't understand a word, they can simply double-click on it for a definition. This product's multimedia amenities include over 7,000 pictures, 800 maps, 50 minutes of audio, and 12 animations on topics such as the amoeba, how birds fly, asexual reproduction, chemical reactions, wind carrying pollen, and nuclear fission. It also includes



The camera icons in Compton's Interactive Encyclopedia allow you to display illustrations that are linked to topics discussed in the text.

60 entertaining and informative video clips on subjects as wide-ranging as cell division and the civil rights movement.

Though it doesn't support Boolean searches, Compton's Interactive Encyclopedia has nine entry paths to help you find out-of-the-way information. For example, initiating a search for the word *design* using the InfoPilot retrieval utility gives references to articles on industrial design and fashion design, along with the names of famous designers and architects. \$149.95; Compton's NewMedia, 800-862-2206.



Circle 448 on reader service card

Oxford University Press

• Oxford English Dictionary

The 20-volume *Oxford English Dictionary, Second Edition*, is the second-best dictionary ever compiled. The best is the Oxford English Dictionary, Second

Our Contributors: MICHAEL J. MILLER is editor-in-chief and GAYLE C. EHRENMAN is an associate editor of *PC Magazine*. BILL MACHRONE is vice president of technology at Ziff-Davis Publishing Company. SHERYL CANTER, JOHN C. DVORAK, JOHN R. QUAIN, JIM SEYMOUR, and BARRY SIMON are contributing editors of *PC Magazine*, and RUBIN RABINOVITZ and DONALD B. TRIVETTE are frequent contributors. LANCE ULANOFF was the associate editor in charge of this story.

■ Bad CD-ROMs: *Dvorak's Duds*

By John C. Dvorak

They asked me to list the five worst CD-ROMs, a task that turned out to be impossible. It's like asking someone to list the five worst TV shows. There are *hundreds* of dreadful CD-ROMs out there, and even among the 100 top CD-ROMs in this story, there are at least a dozen that I find horrible. Some of these come from decent CD-ROM developers who are trying to do their best, so it's obvious that making a great CD-ROM isn't easy.

Poor CD-ROMs have certain characteristics. A bad CD-ROM can result from a poorly designed or unusable, counterintuitive interface. Kathy Smith's *Fat Burning System*, from Xiphias, is one standout in this category. It drives you nuts trying to figure out what to click on. Xiphias, which has

acquired a lot of good content, needs to rethink its user interface as far as I'm concerned. Can you spell *focus group*?

Weak content is another indicator of a bad CD-ROM. I'm thinking of any of the COW CD-ROMs from Quanta Press, although I consider these tongue-in-cheek releases. Quanta goes from one extreme to another in terms of content. Its Consumer Information CD-ROM, for example, is filled with odd-ball and useful stuff.

Weak can also mean annoying. The White Horse Child disk, which reads a hokey story to entertain children, is right up there in the annoyance category. I'm just waiting for a flood of potentially horrendous New Age or fundamentalist-religion CDs to flood the market soon. Particularly annoying is the tide of CD-ROM cookbooks that

purport to computerize your cooking chores. Besides offering little to interest anyone who cooks, many of these offerings border on the ridiculous. The idea of inputting a list of leftovers and letting the computer give you a recipe is ludicrous; what idiot can't figure out this kind of thing for himself?

Technical weakness is the third flaw. Video Cube: Space, from Aris Entertainment, comes to the fore here. On start-up, it tells me that I need 256 colors—not 16—to run the game. Exactly why the programmers can't account for this limitation is a mystery, but my Mach32 card running on an Insight Pentium machine was *not* running 16 colors as the game assumed. It simply wouldn't recognize my hardware properly.

Then there are the spotty CD-

Edition, on CD-ROM.

This disk contains the full text of the printed version: 616,500 words, 137,000 pronunciations, 249,000 etymologies, 2.4 million illustrative quotations, and 577,000 cross-references. Data access is provided by a powerful search engine and a query-language retrieval program that let you gather data in ways you can't with printed dictionaries.

You can conduct wildcard searches, jump to cross-references, filter search results by date or part of speech, and conduct Boolean searches. For more complex searches, however, you'll need to invest some time in learning the program's query language.

This product is a word lover's dream, but in view of the \$895 price, many word lovers won't see that dream become a reality. \$895; Oxford University Press, 800-334-4249 ext. 7390.



Circle 449 on reader service card

Microsoft Corp.

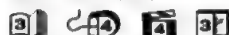
■ Microsoft Encarta

Searching for a CD-ROM encyclopedia with killer multimedia features? Look no further: Microsoft Encarta Multimedia

Encyclopedia is tops in this category. No CD-ROM encyclopedia can match its numbers: over 7,300 images, 8 hours of audio, and 100 video clips and narrated animations—plus numerous photographs, maps, charts, foreign-language samples, instrument sounds, animal cries, and a time line. You can watch demonstrations of how an internal combustion engine works and how bees use dance to communicate. You can also enjoy the

works of Leonardo da Vinci, Picasso, and Rembrandt, or listen to excerpts from Bach, Beethoven, and Mozart.

Encarta's 26,000-article text never reaches the high standard set by its multimedia features, but no other encyclopedia provides the full CD-ROM experience offered by this disk. \$139; Microsoft Corp., 800-426-9400.



Circle 450 on reader service card

■ The Machrone Family's Collection

By Bill Machrone

It was easy to figure out which were the Machrone family's favorite CD-ROMs. We have half a dozen CD-ROM caddies to make switching from one title to another more convenient. The ones that were always in the caddies were the winners.

First and foremost is Microsoft Cinemania '94. We love movies, and Microsoft Cinemania makes them more enjoyable. Not only do we search for titles we'd like to see, but we read reviews of movies we've seen and follow the hypertext trail of actors and

directors to other movies. The odd, interesting facts from the plot summaries are great food for conversation.

Second is New Grolier Multimedia Encyclopedia. It's not as flashy as Microsoft's Encarta, but it has the best content of all of the CD-based encyclopedias. Grolier's has enough depth to fill in for the kids' textbooks when they forget to bring them home the night before the big test. It's competent in biology, geography, politics, and the physical sciences, and it is almost as good as a biographical dictionary for telling you about obscure historical

COVER STORY
The Top 100 CD-ROMs

ROMs that run only on certain systems for reasons that are hard to explain. Even when you have a supposed MPC machine, many CD-ROMs are flaky. The sound doesn't work at all, or it works only half the time.

Finally, the little movies that are often part of a CD-ROM tend to be horrific and herky-jerky. I advise some developers to take a look at Knowledge Adventure's Bug Adventure to see how a movie *should* look.

My advice to anyone who wants to start a collection of useful CD-ROMs is this: Never buy any of these disks sight unseen without a money-back guarantee. Since it costs \$1.50 to crank out a CD-ROM, anything that costs more than \$10 a disk had better be pretty good. There are too many poor-quality disks out there for you to take any chances. □

DeLorme Mapping

• Global Explorer

Global Explorer covers the world from all angles. From the broadest perspective, you see the world; at the most microscopic, you see streets in major cities. In between, you get the best-looking, most detailed on-line maps of the world. Global Explorer includes descriptions of 20,000 historical and

characters. Whether you have kids in school or are just curious about the world, this is one disk to have.

Third, surprisingly, is CorelDRAW. We have the drawing and image-manipulation programs loaded onto the hard disk, but I'm often surprised to come home and find the Corel library of images loaded into the CD-ROM drive. The kids are constantly picking off graphical images for their reports and stories, and sometimes they do so just for fun. Andrew loves the dragons, wizards, and other fantasy characters, while Stephanie delves into the symbols, the scenery, and countless other places. Also, Corel supplies a breath-

geographical features, and street maps for 100 cities. \$99 (estimated street price); DeLorme Mapping, 800-452-5931.



Circle 451 on reader service card

Computer Library

• Computer Select

Want to gain a reputation as a computer guru? With Computer Select, you'll soon be spewing out specs for dozens of products and programs. The disk brings you a year's worth of articles from 150 computer publications, including *Macworld*, *PC Magazine*, *PC Week*, and *PC World*. It includes nearly 75,000 articles, 12,500 computer company profiles, 70,000 hardware and software product specifications, and a spiffy search engine. \$1,250; Computer Library, 800-827-7889.



Circle 452 on reader service card

Johnston & Co.

• The Constitution Papers

No multimedia frills here. This CD is a text-only, DOS-based collection of 44 key historical documents, including the U.S. Constitution, the Declaration of Independence, the Federalist Papers, and the constitutions of the original 13 colonies. These texts have been analyzed by WordCruncher, a concordance program that lists all the significant words in its database. This is an invaluable research tool

taking collection of typefaces with CorelDRAW. We use 'em all.

Fourth, for the moment, is Myst. Even though it forced us to reinstall our sound drivers and then promptly crashed—taking Windows and all the new settings with it—we still love it. Once I sat in that dentist chair cum time machine and the stars changed, I was hooked. I know that Myst is the game du jour; it will be replaced in time by something even better. But in the meantime, there's this power pole I've got to climb. . . .

Fifth on our list is the whole Knowledge Adventure product line, especially the 3-D titles. We're not exactly checking the keyboard for tyrannosaurus

for students and historians. \$99; Johnston & Co., 801-756-1111.



Circle 453 on reader service card

Columbia University Press

• Columbia Granger's World of Poetry

If you love poetry, you'll love the DOS-based Columbia Granger's World of Poetry. The disk comes with texts of 8,500 well-known poems, as well as 3,000 quotations from 1,500 other poems. You can search for poems by author, title, first line, subject, or keyword. Should you buy Columbia Granger's? Only if your love of poetry can overcome \$699 worth of sticker shock. \$699; Columbia University Press, 800-944-8648.

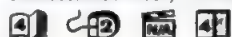


Circle 454 on reader service card

Digital Directory Assistance Inc.

• PhoneDisc

Looking up long-distance numbers can be frustrating, but an electronic phone-number database can make it easier. A good choice is PhoneDisc PowerFinder, a five-disk colossus with 91 million listings. You can retrieve phone numbers by address or type of business. PhoneDisc is just the ticket for tracking down old classmates and sweethearts. \$249; Digital Directory Assistance Inc., 800-284-8353.



Circle 455 on reader service card

drool, but the 3-D is a kick. We may look like jerks, clustered around the monitor with our tacky cardboard glasses on, but we're sharing a family experience, having fun, and learning. Science Adventure, Bug Adventure, 3-D Body Adventure, Speed, Space Adventure; they're in constant rotation.

Finally, there's Microsoft Bookshelf. This was the first major CD-ROM title, and it's still the best for convenient, authoritative writing. I just wish I could fit this one onto my laptop, since I do so much writing on the road. Bookshelf has come a long way from the original pop-up DOS program—and thank goodness. □

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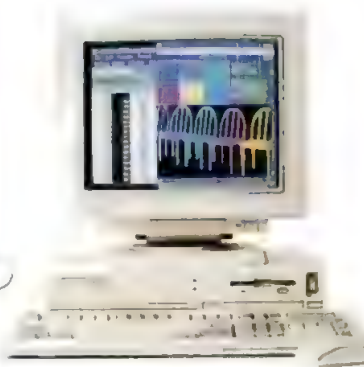
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With SoundBlaster 16-bit sound board, internal dual-speed CD-ROM drive, external stereo speakers, microphone & multimedia software. Starts at \$499.

ProLinea 4/33S Features:

33MHz 486SX
 (upgradable to Pentium Overdrive)
 ♦
 4MB RAM (upgradable to 100MB)
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Compaq ProLinea Net1/25s

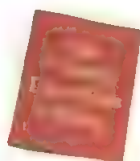
An ideal choice if
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mance at an affordable price. The all-in-one styling saves desktop space and makes setup as simple as plugging the unit in. TabWorks, a Compaq exclusive, is preinstalled for greater ease of use. Network-ready and ideal for peer-to-peer communications.

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 (1024 x 768)
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 MS-Windows 3.1 or MS-WFW 3.11

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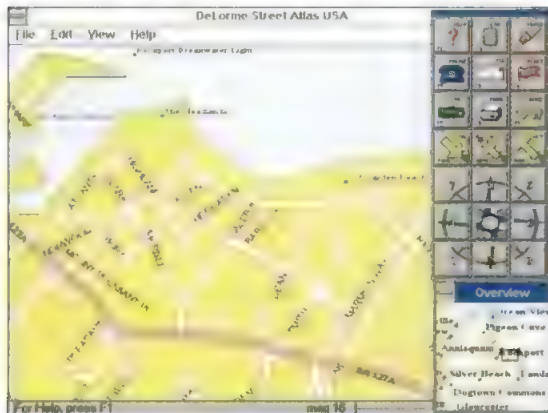
Weekdays 7-7, Sat. 10-4 CST

Ask for our new free catalog.

Random House Reference and
Electronic Publishing

• Random House Unabridged Dictionary

If its 315,000 entries seem paltry next to the Oxford English Dictionary's 616,500, that's because the Random House Unabridged Dictionary, Second Edition, doesn't include obsolete terms and expressions. For some users, Random House will be the better choice because it's a dictionary of



The densely packed Street Atlas USA provides maps showing details of every neighborhood in the United States.

American English, and it's easier to use. The definitions may be a bit terse, but Random House's operation is intuitive, and its price is wallet-friendly. \$79; Random House Reference and Electronic Publishing, 800-733-3000.



Circle 456 on reader service card

DeLorme Mapping

• Street Atlas USA

This is the program to show friends who are considering a CD-ROM drive. You can find locations by name, ZIP code, or phone number, but zooming in is the most fun. Start with a map of the U.S.A. and then, at magnification level 7, highway numbers will appear; at level 13, you'll see railroads, and at 15, you'll read street names. With 12 million street segments packed into the disk, we're talking about every street in the country, including those in that old neighborhood you haven't visited for years. \$169; DeLorme Mapping, 800-452-5931.



Circle 457 on reader service card

Medio Multimedia Inc.

• Jets!

Could an on-line aviation encyclopedia provide any more than Jets! does? Not unless it included action videos, engine sounds, 500 captioned photos, the texts of two books on aviation history, statistics on some 150 jet aircraft, and 22 three-dimensional animations that let you view aircraft from different angles. Fire up your computer and install one of the video drivers included on the disk and you'll be cleared for takeoff. \$59.95; Medio Multimedia Inc., 800-788-3866.



Circle 458 on reader service card

The Software Toolworks Inc.

• The Software Toolworks World Atlas

The maps in The Software Toolworks World Atlas, Version 4.0, aren't as detailed as Global Explorer's, but this program does include over 1,000 color photos, 270 film clips, and audio clips with country-name pronunciations. And if all this data overwhelms you, you

can look at the flags of 200 countries while listening to each country's national anthem. \$59.95; The Software Toolworks Inc., 415-883-3000.



Circle 459 on reader service card

World Library Inc.

• Library of the Future

You'd need an 18-foot floor-to-ceiling bookcase for printed editions of the 1,750 volumes in the Library of the Future, Third Edition. What makes the program doubly useful is a search engine that lets you sift through its many works of fiction, poetry, history, politics, science, religion, and ethics. \$149.95; World Library Inc., 800-443-0238.



Circle 460 on reader service card

Productivity

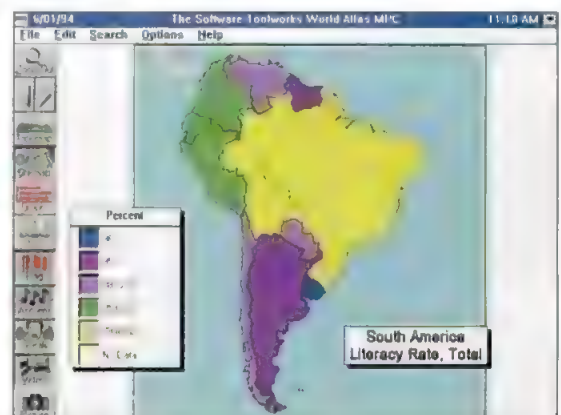
REVIEWS BY JIM SEYMOUR

Addison-Wesley Publishing Co.

• CD-MOM

There aren't many good Windows books, but Woody Leonhard and Barry Simon's CD-MOM: The Mother of All Windows Books, CD-ROM Version, would have stood out even in a field of stellar entries. Witty, idiosyncratic, sometimes cranky, and often corny, the book captures the feeling of a Windows expert sitting at your elbow, chatting away, listening to your complaints, agreeing, offering solutions.

The accompanying CD has more than 240MB of useful stuff. (Many CD-ROMs tucked inside the back covers of books have one-tenth that much content and use only a small fraction of the disk's capacity.) And though there are 20 program demos of questionable value, there's also a complete copy of Dariana's WinSleuth Gold, WinCIM, and the usual CompuServe free-time sign-up offer, plus 5,000 icons, 100 pretty good shareware fonts, and 100 "hand-selected" shareware programs—selected, one assumes, by shareware expert Simon, because this is an A+ list.



The Software Toolworks World Atlas has hundreds of statistical maps that illustrate social and economic conditions in different regions.

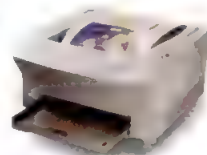
The one thing missing is the text of the book itself. It would have been a big job to move the book's thumbnail sketches and funny kvetches into the digital domain, but it would have been a pleasure to use CD-ROM's search capabilities. (If you



One of these is a color proof and one is output from our new printer. We forgot which is which.

We paid \$70 and waited three days for one of these. The other popped out of our new Tektronix Phaser™ 480 in minutes. Pull out your loupe and start guessing. And while you're down there staring, note our output's phenomenal color. PANTONE®-approved, it's perfect for matching those tricky product colors, logos and skin tones. You might also notice the full 11" x 17" print area. Yes, Virginia, there are tabloid-sized full bleeds. And it shares easily: the Phaser 480 is a work group printer for Macs,

PCs or workstations. Plus, it boasts a powerful RISC processor and true Adobe® PostScript™ Level 2. Spread-sized bleeds? Reprint quality comps? Pre-film proofing right at your desk? Welcome to preproduction heaven. So head down to your nearest Tektronix dealer to see for yourself. And by the way, our guess is that the one on the bottom is our print. Well, then again ...



Tektronix

For a free print sample or dealer location call 800/835-6100, Dept. 32E.

Phaser is trademark of Tektronix, Inc. All other marks are trademarks or registered trademarks of their respective companies.

The Top 100 CD-ROMs

want a CD-ROM with the full text of a good Windows book, take a look at Fred Davis's excellent Windows Bible CD-ROM, which also has shareware, fonts, icons, and more.) \$49.95; Addison-Wesley Publishing Co., 617-944-3700.

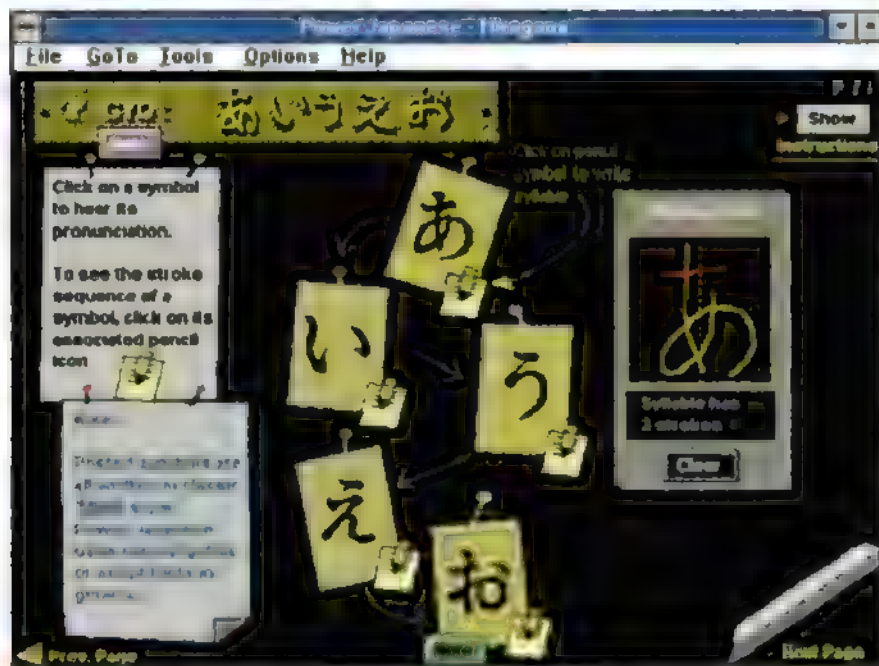


Circle 461 on reader service card

Corel Corp.

• Corel Gallery

There's a huge pile of clip art out there, but much of it is primitive, ugly, out of date, and badly organized. And clip art on



Power Japanese for Windows offers displays that are as beautiful as they are functional, setting the standard for this category of CD-ROMs.

floppy disks is tough to use: Either you fill up your hard disk with megabytes of art, most of which you'll never use, or you do the floppy shuffle every time you want to use an image.

CD-ROMs and clip art were made for each other: everything in one place, indexed, and instantly available. Corel Gallery lives up to that promise with 10,000 very nice clips—most in color—with a printed, color directory of all the images. (Those publishers that don't include complete printed references with their clip-art packages ought to be roasted on a spit.)

Corel Gallery includes flags and maps galore, famous people, great borders and page corners, international symbols, and much more. Though its images are duplicates of those found in CorelDRAW, you'll want Corel Gallery, too, because its images are immediately usable in all your apps, without translation from CorelDRAW's .CDR format.

Corel Gallery also offers easy (if slow)

installation, a thumbnail viewer, keyword searching, and quick and easy drag-and-drop; moreover, it's an OLE 2.0 server. At a list price of \$49, Corel Gallery is a screaming bargain. \$49; Corel Corp., 800-836-3729, 613-728-3733.



Circle 462 on reader service card

BayWare Inc.

• Power Japanese

This program may be impressive on floppy disks, but it's awesome on CD-ROM. A genuinely graphical, even playful ap-

proach to learning to read and speak Japanese, Power Japanese for Windows, Version 2.0, shows how multimedia can liven up a dry subject.

You begin with the basic syllables of Japanese. Not only do you hear the language spoken idiomatically by native speakers, you can also record your own efforts and compare them with the native speakers'. The disk offers zillions of tips and tricks, well-designed animated screens, a two-way (Japanese-to-English, English-to-Japanese) dictionary, essays on Japanese culture, and even a simplified word processor

using kana characters.

This isn't just one of the 100 best CD-ROMs; it's one of the 10 best. Only one question: Why wasn't language lab like this when I was in college? \$389; BayWare Inc., 800-538-8867.



Circle 463 on reader service card

Allegro New Media

• Allegro PC Library

How can I not recommend a disk that includes those two seminal works, Jim Seymour's *PC Productivity Bible* and Jim Seymour's *On the Road*? Even aside from those, this is an important disk for PC users. It includes Winn Rosch's wonderful *PC Upgrade Bible* and *Hardware Bible*; ten *10-Minute Guides* to popular PC apps; a series of inside guides to NetWare, Win-

dows for Workgroups, and LANtastic; Peter Norton's guide to DOS 6.0; and lots more—32 titles in all.

For what you lose in ink-on-paper browsability (did you really plan to relax by a gurgling brook with Stan Schatt's *Understanding Local Area Networks, Third Edition*?), you gain in the powerful CD-ROM benefit of searchability. And you can save your own notes and annotations to the texts. \$99.95; Allegro New Media, 201-808-1992.



Circle 464 on reader service card

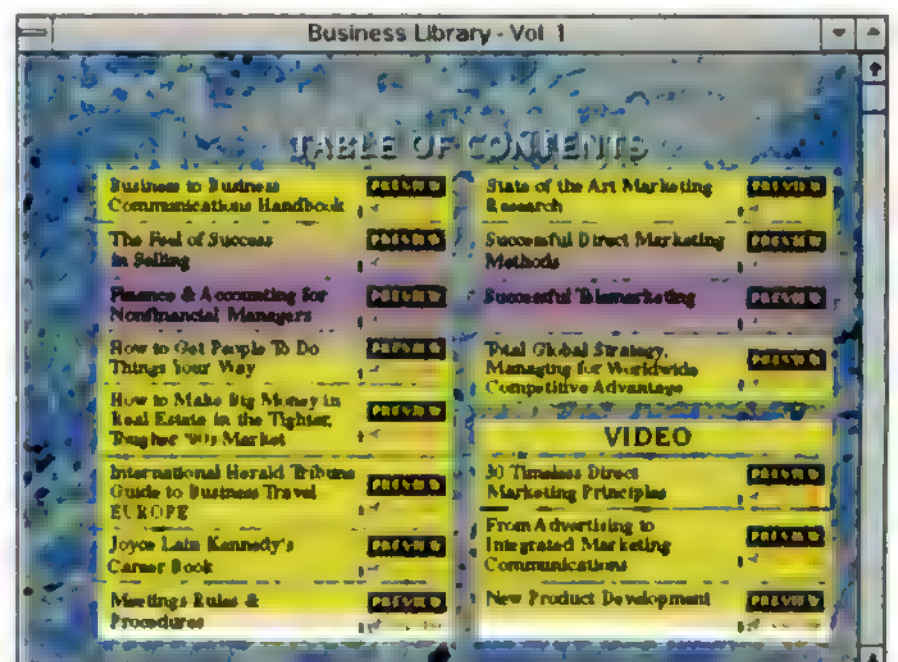
Allegro New Media

• Allegro Business Library

With a dozen business texts and three business videos, Allegro's Business Library, Volume 1, delivers a lot of value. Even if you never look at most of these books—and most buyers will skip many of them—you'll still get more than your \$59.95 worth out of the package.

Among the books is the classic what-does-all-this-mean title for the financially challenged, *Finance and Accounting for Nonfinancial Managers*. Most of the other books—and all three of the videos—lean toward marketing and selling; the videos include Bob Stone's *30 Timeless Direct Marketing Principles* and George Gruenwald's *New Product Development*, also classics.

This is a solid investment for marketers in almost any field and a good bet



Allegro Business Library offers a dozen best-selling business books as well as excerpts from three business videos.

for other businesspeople as well. \$59.95; Allegro New Media, 201-808-1992.



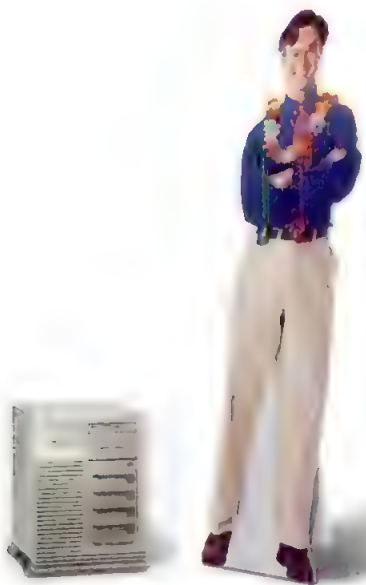
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Monitor disk space down the hall.



Check error logs and diagnose your server across campus



Power cycle the server in Kalamazoo.



Open a window on the world.



HP NetServer LM • 90- and 66-MHz Intel Pentium™ processor • 66-MHz Intel486™ DX2 processor • Dual Intel Pentium 66-MHz Symmetric Multiprocessing (SMP) • Optional internal hot swap disk array (RAID 0, 1, 5, 6) and ECC memory • HP NetServer Assistant 2.0 included • 16-MB RAM standard, 384-MB maximum • Up to 256-KB write-back cache • 9 mass storage shelves • 8 EISA bus-master I/O slots • Integrated EISA Fast SCSI-2, IDE and video controllers • Designed-in security, serviceability, and cooling features • Tested and certified on all major network operating systems

HP NetServer LF • 66-MHz Intel Pentium processor, 100-MHz IntelDX4 processor, 66-MHz Intel486 DX2 processor • Automatic Server Restart • HP NetServer Assistant 2.0 included • Optional internal hot swap disk array (RAID 0, 1, 5, 6) • 8-MB and 16-MB RAM standard, 192-MB maximum • 256-KB write-back cache • 9 mass storage shelves • 2 PCI, 7 EISA bus-master I/O slots • Integrated EISA Fast SCSI-2 IDE and video controllers • Designed-in security, serviceability, and cooling features • Tested and certified on all major network operating systems

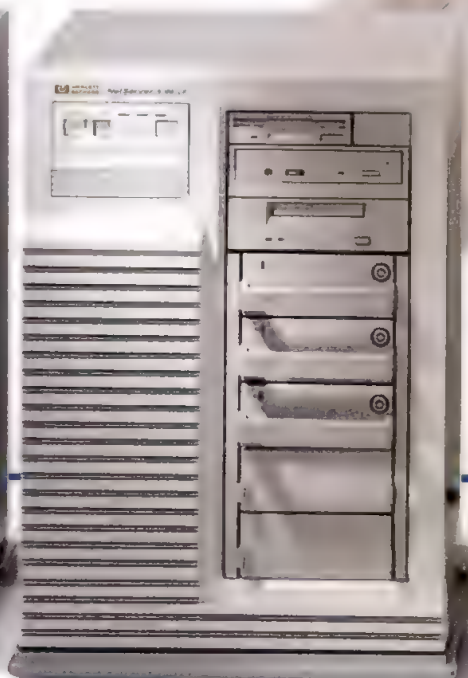
HP NetServer LC • 66-MHz Intel Pentium processor, 100-MHz IntelDX4 processor, 66-MHz Intel486 DX2 processor • Automatic Server Restart • 8-MB and 16-MB RAM standard, 192-MB maximum • Up to 256-KB write-back cache • 1 PCI, 1 PCI/EISA-combo, 4 EISA I/O slots • 5 mass storage shelves • Integrated EISA Fast SCSI-2, IDE and video controllers • Designed-in security, serviceability, and cooling features • Tested and certified on all major network operating systems

Management Solutions: HP Remote Assistant • \$999* for intelligent EISA card and software • Complete remote control of server • Continual environmental and server hardware monitoring and error logging • Automatic Server Restart • Works on all major network management environments **HP NetServer Assistant 2.0** • Included with HP NetServer LM and LF; \$495* option for HP NetServer LC • A customizable server management software tool set • Proactive system/component alerting and status information • Includes HP OpenView 7.1 • Comprehensive troubleshooting tools

HP Service and Support • A full range of support service from HP or HP-authorized resellers • Three-year, on-site next-business-day limited warranty standard on all products, affordable upgrades to same-business-day or 24-hour, 7-day, 4-hour response • Complete technical and support information available through a wide range of media: HP Support Assistant CD-ROM subscription, fax-back service, BBS, CompuServe forum and telephone support



HP NetServer LM from \$4,449*



HP NetServer LF from \$3,249**



HP NetServer LC from \$2,529***

Now you can be everywhere at once. Without going anywhere.

HP NetServers are easy to manage even when you're not there.

With today's increasingly complex networks, it seems LAN managers depend more on their beepers and the corporate travel office than anything else. Go here, go there, fix this, fix that. Leaving no time for the kind of proactive work that could avert trouble in the first place.

Maybe that's why so many network administrators are turning to the affordably priced lineup of HP NetServers. Take a quick look, and you'll find optimized price/performance servers to match every need. But you'll also discover how to answer your need for servers that are easier to manage.

HP NetServer Assistant software helps you prevent problems before they occur—and gives you tools to resolve them if they do. And because it supports the HP OpenView platform, you can access your entire network from a single console. With HP Remote Assistant, you can manage the server from anywhere, even if it's down. Even if the network's down.

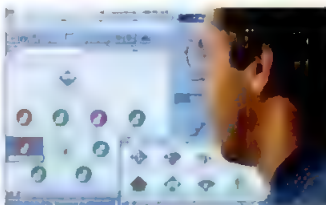
Performance? You can choose from single and dual Pentium™ models, as well as those with Intel486™ DX2 and DX4 processors. For compute-intensive applications, you'll want to look at the HP dual Pentium Symmetric Multiprocessing model. Whatever you select, you'll enjoy maximized uptime, thanks to RAID-based fault tolerance, hot swappable drive replacement and error checking and correcting memory.

Perhaps best of all, HP NetServers come to you from the company with an unparalleled reputation for quality, reliability and support—Hewlett-Packard. Which is undoubtedly why we can offer one of the industry's best warranties: three-year, next-business-day, on-site delivered by HP or your reseller.

For more information on

HP NetServers, call us today at 1-800-533-1333, Ext. 8439. And the next time you feel a need to go somewhere, make it a vacation.

Another smart networking product from HP.



With HP NetServer Assistant 2.0, you get intuitive viewing of your network, comprehensive diagnostics, plus local and remote management, all in one package.



**HEWLETT®
PACKARD**

Compton's NewMedia

• **PR Handbook**

Compton's Public Relations Handbook is a useful introduction to the world of corporate public relations. The content is not exactly hot off the presses: This is the 1987 revised third edition of Dilenschneider and Forrestal's classic *Public Relations Handbook*. But despite the absence of multimedia touches, this is a broad introduction to the ideas behind big-company public relations. The disk also includes a Merriam-Webster dictionary and thesaurus. \$49.95; Compton's NewMedia, 619-929-2500.

2 1 2 1 3 1

Circle 466 on reader service card

Davidson & Associates Inc.

• **Your Personal Trainer**

The right combination of pep talks, drills, test-taking strategies, and actual SAT-like printed materials, *Your Personal Trainer for the SAT*, Version 2.0, is a good warm-up for the Big Day. Best of all, the program has been rewritten to reflect the new-style Scholastic Aptitude Tests that went into effect in March of this year. A bright, effective interface makes it fun to use, too. \$59.95; Davidson & Associates Inc., 800-545-7677.

3 1 2 1 3 1

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Interactive Publishing Corp.

• **1,000 of the World's Greatest Sound Effects**

1,000 of the World's Greatest Sound Effects is the best and most affordable collection of 8-bit and 16-bit sound effects found yet. Well organized, easy to use, and of good to excellent quality, the effects offered by this product can brighten up your presentations, irritate your coworkers, and startle your family. The package also includes *Multimedia Sound Studio*, one of the best stereo rack-like CD-ROM playback utilities. \$39.95; Interactive Publishing Corp., 914-426-0400.

3 1 2 1 3 1

Circle 468 on reader service card

InfoBusiness Inc.

• **Job Power Source**

In the decade of "re-careering," this disk can be an important tool for those facing a midcareer or midlife job search. A good Windows interface (despite an icon toolbar called a *toolbelt*) and surprisingly good (but still choppy) video clips augment solid texts that you can highlight and annotate. *Job Power Source* is a wise investment for the adult job hunter. \$49.95; InfoBusiness Inc., 801-221-1100, 800-657-5300.

3 1 2 1 3 1

Circle 469 on reader service card

Developer's Tools

REVIEWS BY SHERYL CANTER

Microsoft Corp.

• **Microsoft Developer Network, Level 2**

If you're interested in developing for Microsoft operating systems—nontrivial stuff like DOS and Windows—then you'll want to subscribe to the *Microsoft Developer Network, Level 2*, a comprehensive resource from Microsoft that consists of two pieces. The Development Library, Disk 7, is a collection of books, technical notes, white papers, product documentation, sample code, and other useful information. The Development Platform, April 1994, adds the Microsoft Software Development Kits for Object Linking and Embedding (OLE), Open Database Connectivity (ODBC), Win32, and other products; it also includes prerelease versions of Microsoft operating systems such as Windows NT, Version 3.5.

This program offers quality information, and navigation is made easy via the Microsoft Multimedia Viewer. Topics can be printed, copied, and annotated. Annotations appear as little red paper clips in the upper-left-hand corner;

click on a paper clip to view an annotation. You can search for keywords within a topic, and there is also a powerful engine for searching through the entire library. Cross-topic searching supports full Boolean logic, and retrieval is very fast. Bookmarks let you jump quickly back to topics of interest. Finally, the on-line help system is as comprehensive as the library itself. \$495 per year; Microsoft Corp., 800-759-5474.

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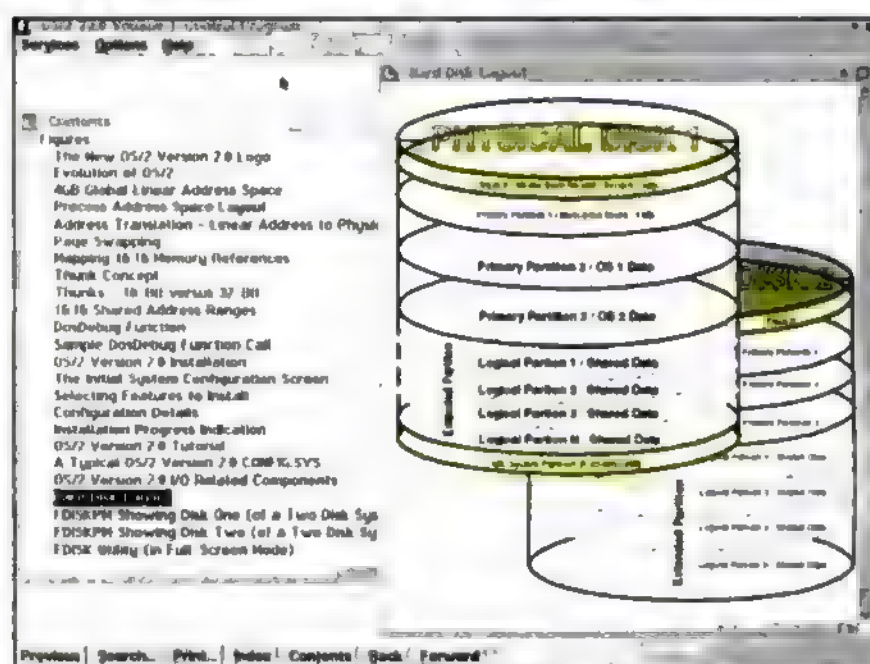
IBM Corp.

• **The Developer Connection for OS/2**

The *Developer Connection for OS/2*, Volume 3, is a subscription service for OS/2 developers that includes three components: the User's Guide, the Catalog, and the Browser. The User's Guide takes advantage of the OS/2 book format for easy navigation.

The Catalog contains a large collection of programs from IBM and third parties: communication tools, databases, development tools, service packs for OS/2 and other IBM products, and utilities of all kinds. An option allows most installed programs to be automatically placed in a special folder for easy access.

The Browser is a collection of folders



The Developer Connection for OS/2 includes a browser for viewing technical documents and manuals; shown here is Volume 1 of the OS/2 Red Books.

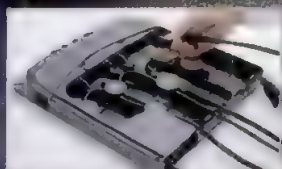
containing manuals, technical references, magazine articles, and white papers. All but the white papers and articles are stored in OS/2 book format, which has a built-in hypertext and a search engine. This is the

"Have you looked under your desk recently?"

Mass, PC WORLD
The... for the Home
...icle, June 1994.

Introducing PowerManager™ with cord management capabilities!

Chances are, you've got a jangle of power cords under your desk that need to be tamed. As PC WORLD says, "It's time



you needed a way to tame this mess of cords with APC's PowerManager™. Just slide back

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system to have a spec sheet automatically sent right back to you: (800)347-FAXX.



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disk to get if you're an OS/2 developer. \$199 per year; IBM Corp., 800-633-8266.



Circle 471 on reader service card

Hewlett-Packard Co.

• HP Support Assistant

Updated quarterly, HP Support Assistant is a subscription service offered by Hewlett-Packard Co. for HP support technicians. We looked at the May 1994 issue. You can access manuals, technical diagrams, usage instructions, and other information for HP products through the user-friendly Microsoft Multimedia Viewer. If you rely on HP products, this is the disk to have. \$395 per year; Hewlett-Packard Co., 800-457-1762, 317-364-8882.



Circle 472 on reader service card

Micro House International

• Micro House Technical Library

Micro House Technical Library offers CD-ROM versions of three publications from Micro House: *The Encyclopedia of Main Boards*, *The Encyclopedia of Hard Drives*, and *The Network Interface Technical Guide*. The books describe the technologies and list specifications and manufacturer information for thousands of devices—essential reference material for technology junkies. \$349; Micro House International, 800-926-8299, 303-443-3388.



Circle 473 on reader service card

Art & Music

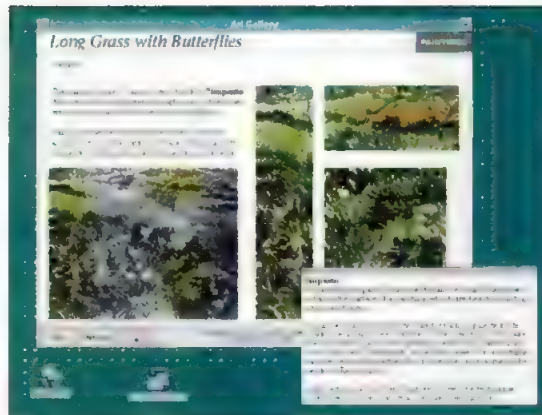
REVIEWS BY JOHN R. QUAIN

Microsoft Corp.

• Microsoft Art Gallery

When it comes to art, most people subscribe to the "I don't know how to define it, but I know it when I see it" school of thought. Microsoft Art Gallery certainly enables you to see a lot of it—and may change how you think about painting.

Based on the National Gallery of London's collection of 13th- to 20th-century paintings, Microsoft Art Gallery beautiful-



Microsoft Art Gallery's paintings are adroitly and beautifully handled on-disk, allowing you to explore the paintings at your own pace.

ly presents the lives of the painters, a historical atlas, and four narrated tours. It also has practical help, such as spoken pronunciations; there's no excuse for mispronouncing *Ingres* or *trompe l'oeil* anymore. Microsoft Art Gallery's paintings are hyperlinked to other related works—an advantage this medium has over typical museums. There are limitations, however.

Much of the material only scratches the surface. Microsoft Art Gallery won't tell you about the controversy surrounding Velasquez's *The Rokeby Venus*, and because it's based on a single art collection, its coverage is limited. Also, the images don't match the detail of photographs in a good art book. Van Gogh's brush strokes look smudged, and the point in Seurat's pointillism is blotchy. But what this disk lacks in completeness and detail, it makes up in its elegant yet easily navigated presentation. \$79.95; Microsoft Corp., 800-426-9400, 206-882-8080.



Circle 447 on reader service card

Medio Multimedia Inc.

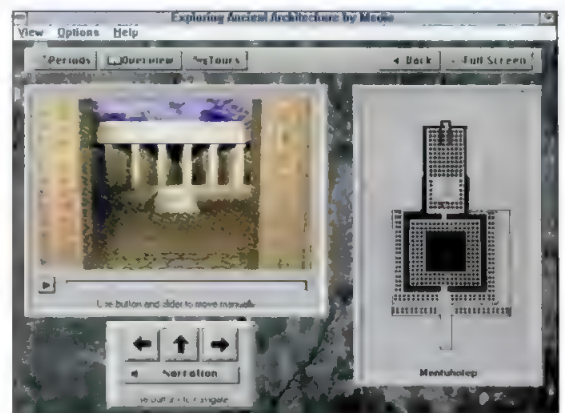
• Exploring Ancient Architecture

Goethe once called architecture "frozen music." Exploring Ancient Architecture, from Medio Multimedia, sets that music in motion with impressive 3-D animation.

Covering four eras—the Neolithic,

Egyptian, Greek, and Roman periods—this disk uses multimedia effects to recreate architecture none of us can ever visit. Each period is covered by an overview using slides and models, while the narrator delivers a thumbnail sketch of the era's crowning architectural achievements. The overviews can be tedious, but the real gems are the building tours.

The seven building tours allow you to become a virtual tourist. In the Neolithic period, for example, you can wander through Stonehenge, which actual tourists are no longer allowed to do. Furthermore, buildings long since destroyed (such as the Temple of Khons) are recreated for you to stroll through.



A virtual tour of ancient Egypt's Temple of Mentuhotep is just one of the 3-D animations included in Exploring Ancient Architecture.

Other aspects of the disk suffer from a lack of creativity. The navigation controls are stifling, and search mechanisms are nonexistent. In addition, the narration sounds like a sixth-grade history-class film. As a reference tool, Exploring Ancient Architecture is merely a coffee-table book; still, it's a great coffee-table book. \$59.95; Medio Multimedia Inc., 800-788-3866.



Circle 458 on reader service card

Microsoft Corp.

• Microsoft Multimedia Schubert

Voyager wrote the CD-ROM on how to create top-notch multimedia titles. The

Go Ahead, Get Carried Away





1. Follow instructions on the other side

Back

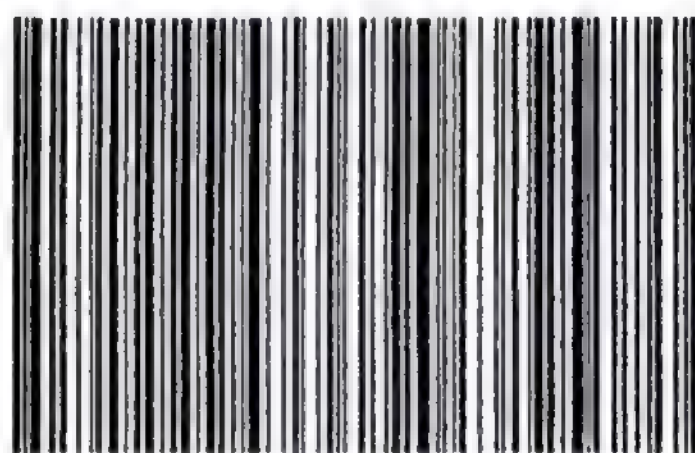
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Inverted Back

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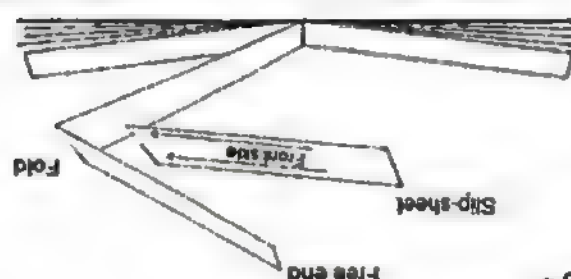


GbslipSheet-001

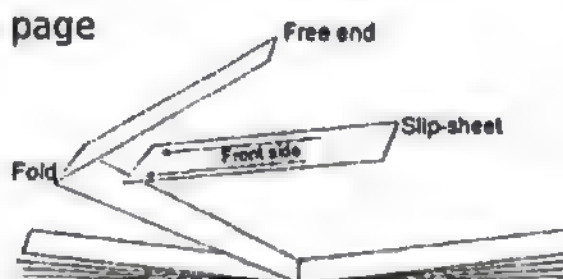
Inverted Foldout slip-sheet

Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
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Let Your Imagination Go Wild





Experience the World of Gateway 2000!

Go ahead. Let yourself get carried away. Because when you buy a computer from Gateway 2000[®], you can lose yourself in a whirlwind of extraordinary computer systems and fantastic software. You'll feel like there's absolutely nothing on earth you can't do! So let your imagination run wild. Soon you'll be opening the doors to Gateway 2000 where prices are a breeze and computer dreams really do come true!

Most Gateway desktop systems now include larger hard drives, including a 1GB hard drive on our P5-90XL Pentium[™]-based machine. So there's no way you can get caught short of space. A TelePath[™] fax/modem is included on our new Pentium-based multimedia systems. And CD-ROM drives are standard on all desktop systems. Just imagine what you can accomplish with Microsoft's Office Professional, including the latest versions of MS Word, Excel, PowerPoint[®] and Access[®], now standard on all 486 PCI and Pentium-based systems.

A standard three-year limited parts warranty on all desktop systems and Gateway monitors tops off our tradition of bringing you the best service and support in the industry.

Sound too good to be true? Well, that's not all. The Gateway HandBook[®] 486 portable PC is now priced at legendary low prices.

Gateway 2000 has grown to become a Fortune 500 company, but we're still the down-to-earth Midwesterners who have always given you a good old-fashioned value. Go ahead, take a visionary's leap into the Gateway 2000 experience. Soon you'll be saying, "There's no place like Gateway, there's no place like Gateway."



GATEWAY2000

"You've got a friend in the business."[®]

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All the incredible talent in this ad is provided by Gateway 2000 employees and family members.



Everything Under The Sun!

Supernatural power. Mesmerizing features. Stunning software. It's the Gateway 2000® experience. A place where you can have the best CPUs in the land — and so much more — when you buy a Gateway 2000 Pentium™-based system. And while others are huckstering their stripped-down Pentium-based computers, Gateway presents systems packed with the all the stuff dreams are made of!

There's virtually no end to the features included: hard drives up to 1GB, CD-ROM drives, outstanding sound and video performance, the best software, fax/modems on two new multimedia models, and a standard three-year limited parts warranty.

Your dream machine no longer eludes you. Gateway 2000 is making those dreams come true!

Raising The Roof Extras

We always want to keep our customers ahead of the industry. So along with Intel®'s super-charged Pentium processor, Gateway helps you extend the life of your system by including

incredible 540MB, 730MB or 1GB hard drives on all Pentium-based systems. Get used to the feeling of being spoiled, because you also get CD-ROM drives, superior video performance *and* a ton of memory on *all* desktop systems!

All Pentium processor-based models include a PCI local bus and an enhanced PCI/IDE controller allowing your hard drive to transfer data up to twice as fast as non-enhanced systems.

And now Gateway's high-quality desktop systems *and* Gateway monitors are backed by a three-year limited parts warranty. Believe it — this is one of the best warranties you'll find anywhere!

Multimedia Mania

For those who insist on only the very best, your Shangri-La is our new P5-60 and P5-90 Best Buy multimedia systems. Watch out, 'cuz they're jam-packed with all the premium multimedia features you can imagine! Including a TelePath™ fax/modem and communications software so you can speak to the world from your own living room. And tunes never sounded so good with a 16-bit



sound card and Yamaha® stereo-quality speakers. Play your audio CDs, hear audio clips or record audio all in perfect harmony.

Wondering what "multimedia" *really* means for you? It's a whole new universe of knowledge, entertainment, communication *and* educational capabilities. Talk about being entranced! You'll experience interactive, full-motion video and stereo audio. And Gateway gives you the key to this universe in a super-fast, feature-packed machine.

Get the best of all possible worlds with these new P5-60 and P5-90 Best Buy multimedia machines!

Software Nirvana

It's a sweet deal. All Gateway Pentium-based systems now come with Microsoft Office Professional, an incredible combination of Microsoft's most popular business applications, including Microsoft Word, Excel, PowerPoint® presentation graphics program, and Access® database, all on a single CD with on-line manuals.

These programs in Office Professional are so tightly integrated, they work together as if they were a single

program. Also included is Corel Professional Photos CD Sampler with tools to view Photo CD images.

Call for more great software options including our value-packed Multimedia Starter Pack.

P5-90XL Paradise

Is it fantasy or for real? Well, it's the Gateway P5-90XL. This ultimate high-flying Pentium-based PC has a larger-than-life 1GB hard drive. You're gonna get all the power and speed you need for today *and* tomorrow! And an ATI GX video card using the Mach 64 graphics accelerator, one of the first and fastest 64-bit accelerators on the market. It's awe-inspiring to see the display on the 17-inch CrystalScan® monitor. Sound, you ask? Ensoniq®'s Soundscape™ wavetable sound card makes a staggering difference in audio quality. And you'll get a great balance of crisp highs and plenty of heart-pounding bass — in full stereo sound — from the Altec Lansing ACS-31 speakers, with subwoofer.

And for the system of *your* dreams, we'll configure a system specifically to fit your needs. Get everything under the sun with a powerful value-packed Pentium-based system from Gateway 2000!



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You'll be in paradise with a loaded Gateway P5-90XL machine!

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GATEWAY2000
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You'll be transported to outer bounds when you discover the ColorBook™ from Gateway 2000.® Experience the rapture of color portability *and* performance with a 250MB hard drive on our 50MHz and 75MHz models. A rainbow of 256 brilliant colors in VGA mode bursts from an incredible 10-inch dual-scan screen on three ColorBook models. You won't find another portable screen this big, this affordable, anywhere else.



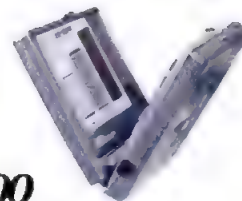
And while everyone else is hiking up their color portable prices, Gateway still offers you an incredible value on our feature-packed ColorBooks, from the \$1,999 SX model right up to the DX4-75. And our DX2-50 model recently won *PC World's* Best Buy award in the Power Mobile PC category.

All Gateway ColorBooks are based on the Intel® SL Enhanced 486 processor with enough power and memory to run all your Windows applications. Weighing less than 5.7 pounds, measuring 1.77-inches thin, all models include two PCMCIA Type II or one Type III slots, excellent battery life, carrying case and a great suspend/resume feature. Our DX2 and DX4 models also include PCMCIA fax/modems. You also get Microsoft Works™ or MS Office Professional standard.

No, it's not an illusion ... it's the ColorBook from Gateway 2000.



GATEWAY2000
HANDBOOK 486



Visualize the ideal portable experience. On the road to enlightenment you'd like to have a lightweight, compact, real 486 PC at an uncommonly low price. The Gateway 2000 HandBook® 486 is so extraordinary, it's portable computing utopia! With unbelievable prices on all HandBook models (they start at just \$999!) there's never been a better time to indulge yourself in a world of 486 power that you can take anywhere.

The HandBook's slight frame — weighing less than three pounds and measuring roughly 10 x 6 inches — makes it an enchanting little PC. The HandBook DX2-50 gives you more MIPS per pound than any other portable PC. With Microsoft Office Professional included, the DX2-50 is an unbeatable value. And at these prices you can get the HandBook as a companion to your desktop system.

The HandBook's features are astounding. It has a bright, backlit VGA screen and a comfortable, touch-type keyboard along with an external diskette drive and leather carrying case. With two batteries included, the HandBook also lets you "hot swap" — change batteries or peripheral while the PC is running without rebooting the system or losing data.

All Gateway ColorBook and HandBook portable PCs come with a standard one-year limited parts warranty. A special VIP warranty is available only at the time of purchase for an additional \$100.



You Can Have It All!

The Gateway 2000 Family PC

There's no place like home when you have a Gateway 2000® Family PC™ in the house. Every member of your family will be swept away as they discover inspiration, entertainment and learning experiences.

This fully equipped multimedia system takes you to a whole new dimension. You get a fast CD-ROM drive to run the best programs and games with sound, pictures, animation and video. With its high-quality sound card and speakers, the Family PC lets you play music CDs, hear audio clips or record audio — all with magical stereo sound.

The Family PC's fax/modem has all the communication software you need to access information and other computer users from all over the world through on-line services.

Experience a virtual software playground with Microsoft Works™ Multimedia Edition, MS Encarta 1994 Multimedia Encyclopedia, MS Money,™ new MS Complete Baseball, MS Golf, and Corel Professional Photos CD Sampler.

You won't find another home PC more loaded than the Gateway Family PCs and our Pentium-based multimedia systems — in any land.

3-Year Warranty

Gateway desktop systems come with one of the strongest warranties in the industry. All Gateway 2000 desktop PCs are backed by a three-year limited warranty on parts. The new three-year limited parts warranty includes Gateway monitors.

Gateway customers also receive a 30-day money-back guarantee and toll-free technical support. And *PC Magazine* readers recently honored us, for the fourth consecutive time, with their highest rating in *PC Mag's* Service and Reliability survey.

On-site service is available during the first year in most U.S. locations and may be provided without charge if our technicians determine it necessary.

For details on our new warranty and all of our service and support policies, please call or write for a free written copy.

Payment Options

Gateway accepts most major credit cards and C.O.D. terms, with net 30-day terms and leasing options available to qualified commercial customers. You can also apply for the Gateway 2000 DuoLine™ MasterCard® Card, issued by Dial National Bank, Des Moines, Iowa.

To Other Worlds

Gateway 2000 customers in Canada and Puerto Rico receive toll-free telephone service in both countries (see the back page of this ad for special 800 numbers) along with award-winning technical support and CSA approvals. On-site service is available in some Canadian and Puerto Rican locations, and our international shipping rates are among the most competitive in the industry.



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Multimedia Systems

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- Intel® 33MHz 486SX CPU*
- 4MB RAM
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- ▼ 2400/9600 Data/Fax Modem
- 3.5" Diskette Drive
- 14" Color SVGA Monitor
- Mini Desktop Case
- 101-Key Keyboard & Mouse
- MS-DOS® 6.2 & WFW 3.11
- ▼ MS Works™, Encarta, Baseball, Money™, & Golf
- ▼ 3-Year Limited Parts Warranty

\$1499

4DX2-66 FAMILY PC

- Intel 66MHz 486DX2 CPU*
- 8MB RAM, 128KB Cache
- 420MB 13ms IDE Hard Drive
- Local Bus Graphics with 1MB
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- 3.5" Diskette Drive
- 14" Color SVGA Monitor
- Mini Desktop Case
- 101-Key Keyboard & Mouse
- MS-DOS 6.2 & WFW 3.11
- ▼ MS Works, Encarta, Baseball, Money, & Golf
- ▼ 3-Year Limited Parts Warranty

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P5-60 BEST BUY

- Intel 60MHz Pentium™ CPU*
- 8MB RAM, 256KB Cache
- 540MB 13ms IDE Hard Drive
- PCI Enhanced IDE Interface
- PCI Local Bus Graphics with 1MB
- ▼ Double-Speed CD-ROM
- ▼ 16-Bit Sound Card & Yamaha Speakers
- ▼ TelePath™ II 14.4K Fax/Modem
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- 15" Color CrystalScan® Monitor
- Desktop Case
- 101-Key Keyboard & Mouse
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- ▼ MS Office Professional CD
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P5-90 BEST BUY

- Intel 90MHz Pentium CPU*
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- PCI Enhanced IDE Interface
- PCI Local Bus Graphics with 2MB
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- ▼ 16-Bit Sound Card & Yamaha Speakers
- ▼ TelePath II 14.4K Fax/Modem
- 3.5" Diskette Drive
- 15" Color CrystalScan Monitor
- Desktop Case
- AnyKey® Keyboard & Mouse
- MS-DOS 6.2 & WFW 3.11
- ▼ MS Office Professional CD
- ▼ 3-Year Limited Parts Warranty

\$2999

Professional Systems

4SX-33

- Intel 33MHz 486SX CPU*
- 4MB RAM
- 340MB 13ms IDE Hard Drive
- Local Bus Graphics with 1MB
- ▼ Double-Speed CD-ROM
- 3.5" Diskette Drive
- 14" Color SVGA Monitor
- Mini Desktop Case
- 101-Key Keyboard & Mouse
- MS-DOS 6.2 & WFW 3.11
- ▼ MS Works 3.0 CD
- ▼ 3-Year Limited Parts Warranty

4SX-33 \$1299

4DX2-66 \$1599

(w/ 340MB Hard Drive)

P4D-66

- Intel 66MHz 486DX2 CPU*
- 8MB RAM, 128KB Cache
- 730MB 13ms IDE Hard Drive
- PCI Enhanced IDE Interface
- PCI Local Bus Graphics with 1MB
- ▼ Double-Speed CD-ROM
- 3.5" Diskette Drive
- 15" Color CrystalScan Monitor
- Desktop Case
- AnyKey Keyboard & Mouse
- MS-DOS 6.2 & WFW 3.11
- ▼ MS Office Professional CD
- ▼ 3-Year Limited Parts Warranty

\$2199

P5-60

- Intel 60MHz Pentium CPU*
- 8MB RAM, 256KB Cache
- 540MB 13ms IDE Hard Drive
- PCI Enhanced IDE Interface
- PCI Local Bus Graphics with 1MB
- ▼ Double-Speed CD-ROM
- 3.5" Diskette Drive
- 15" Color CrystalScan Monitor
- Desktop Case
- AnyKey Keyboard & Mouse
- MS-DOS 6.2 & WFW 3.11
- ▼ MS Office Professional CD
- ▼ 3-Year Limited Parts Warranty

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P5-90 XL

- Intel 90MHz Pentium CPU*
- 16MB RAM, 256KB Cache
- ▼ 1 GB 10ms IDE Hard Drive
- PCI Enhanced IDE Interface
- ▼ ATX Mach 64 with 2MB VRAM
- ▼ Double-Speed CD-ROM
- ▼ 16-Bit Wavetable Sound Card & Altec ACS-31 Speakers
- 3.5" Diskette Drive
- 17" Color CrystalScan 1776LE
- Tower Case
- AnyKey Keyboard & Mouse
- MS-DOS 6.2 & WFW 3.11
- ▼ MS Office Professional CD
- ▼ 3-Year Limited Parts Warranty

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Portables

HANDBOOK® 486

- 2.94 Lbs., 9.75" x 5.9" x 1.6"
- SL Enhanced Intel 486 or DX2 Processor
- 4MB or 8MB RAM (expandable to 20MB)
- 80 to 250MB IDE Hard Drive
- External 3.5" Diskette Drive
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- 2 NiMH Batteries & AC Pack
- Suspend/Resume Feature
- 1 PCMCIA Type II Slot
- EZ Point™ Integrated Pointer
- 78-Key Keyboard
- Parallel, Serial & PS/2® Ports
- Leather Carrying Case
- MS Works for Windows 3.0 or MS Office Professional
- MS-DOS 6.2, WFW 3.11 & Serial Transfer Cable

HANDBOOK 486SX-25

4MB RAM, 80MB Hard Drive, Works

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HANDBOOK DX2-40

8MB RAM, 130MB Hard Drive, Works

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HANDBOOK DX2-50

8MB RAM, 250MB Hard Drive, MS Office Professional

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COLORBOOK™

- 5.7 Lbs., 11.7" x 8.5" x 1.77"
- SL Enhanced Intel 486, DX2 or DX4 Processor
- 4MB or 8MB RAM (expandable to 20MB)
- 3.5" Diskette Drive and Removable 250MB IDE Drive
- 10.3" or 9.4" VGA Dual-Scan STN Color Display
- NiMH Battery & AC Pack
- Suspend/Resume Feature
- 2 PCMCIA Type II Slots (1 Type III)
- Integrated Trackball (2 buttons)
- 85-Key Keyboard
- Parallel, Serial, PS/2 & VGA Ports
- MS Works or Office Professional
- MS-DOS 6.2 & WFW 3.11

COLORBOOK 486SX-33

4MB RAM, Case, Works

\$1999

COLORBOOK DX2-40

4MB RAM, Fax/Modem, Case, Works

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COLORBOOK DX2-50

8MB RAM, Fax/Modem, Case, Office Professional

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Extraordinary Extras!

A wonderland of value: Gateway 2000's peripherals and software, sold only with the purchase of a system.

MULTIMEDIA

Basic Audio Multimedia Kit

Here's everything you need to add multimedia to a Gateway PC.

- Gateway 2000 16-bit CD-quality sound card, compatible with Sound Blaster™ cards, with MIDI/game port, mic in, stereo line in/out
 - 2 Labtec® CS-180 speakers
- \$109 (with system purchase)**

Wavetable Audio Multimedia Kit

Once you've heard wavetable audio, basic audio will never do!

- Ensoniq® Soundscape™ 16-bit wavetable sound card, MT-32 and FM mode compatible. Supports most software for popular sound cards and standards including General MIDI, Sound Blaster, AdLib, Roland MPU 401, MS Windows Sound System and MT 32
 - New Altec Lansing ACS-31 three-piece speaker system
 - MidiSoft® Sound Explorer and Time Warner's Aegis™ software
- \$249 (with system purchase)**

Altec Lansing ACS-31 Speakers

A Gateway exclusive from Altec Lansing: a three-piece speaker set at a two-piece price. Two 3-inch free-standing speakers crank out up to five watts per channel while the subwoofer can deliver 15 watts of heart-pounding bass. **\$119**

Multimedia Software Starter Pack

You get nearly \$700 worth of software for less than \$100! Package includes: Cinemania '94, Mad Dog McCree, Tuneland, Mayo Clinic Family Health Book, Better Homes and Gardens Cookbook, The Lawnmower Man, Sitting on the Farm, Mavis Beacon Teaches Typing, Chess Master 3000, U.S. Atlas and World Atlas. You also get a compact disc cleaner and 20-disk storage rack. **\$129**

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CrystalScan® 17-Inch Monitor

Non-interlaced color monitor with intelligent multi-scanning analog color display capable of 1280 x 1024 resolution in non-interlaced mode, .26 dot pitch. Upgrade from a 14-inch CrystalScan 1024NI monitor **\$395**

Upgrade from a 15-inch CrystalScan 1572 monitor **\$335**.

(Prices good only for upgrades at the time of system purchase.)

COMMUNICATIONS & STORAGE

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Internal fax/modem, 14,400bps modem, V.32bis, with 14,400bps fax capability. Includes CommWorks™ data and fax communication software, CoSession™. Host remote diagnostics, plus a CompuServe® trial membership. **\$99**

Colorado Memory Systems® TBU

250MB internal tape backup unit copies up to 9.5MB per minute. Comes with MS Windows™ and DOS software, one tape and cable. **\$149**

PRINTERS

Hewlett®-Packard 4L LaserJet Printer

A full-featured 300dpi printer loaded with enhanced PCL 5 and 26 scaleable typefaces with 1MB standard HP Memory Enhancement Technology. Parallel cable included. **\$699**

Hewlett-Packard 4L LaserJet Printer

A 600dpi printer for four times the dots of 300dpi laser printing with enhanced PCL 5 and 45 scaleable typefaces. 2MB standard memory and 3 universal SIMM slots available for additional memory or PostScript fonts. Parallel cable included. **\$999**

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Get the look of a laser at a dot matrix price with the Stylus 800. Prints 150 characters per second at 360dpi — fast and quiet! **\$289**

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PORTABLES

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- ColorBook™ carrying case. **\$49**
- HandBook leather carrying case. **\$55**
- Extended VIP warranty — we ship a replacement to you within 24 hours during warranty. Point of sale only. **\$100**

Call the Gateway 2000 special Component Add-ons division at 800-846-2080 for our complete line of extras for Gateway customers.



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■ Applications on CD-ROM

By Michael J. Miller

What can CD-ROM technology offer typical business applications? Now that CD-ROM drives have become more prevalent on desktop PCs, that's a question many software developers and users are asking. But while a CD-ROM version of a software package can be more convenient, prove more cost-effective, and contain more information than a floppy disk version, CD versions of business applications are still few and far between.

For large applications, such as the office suites from Lotus Development Corp., Microsoft Corp., and WordPerfect Corp., the advantages seem clear enough. Just installing the 30-something disks that contain these programs takes forever. Merely placing the floppy disk version onto a CD-ROM provides a user with an immediate benefit. And for the developer, a single CD-ROM costs less to produce than even three or four floppy disks. If the developer passes the savings on to users, everyone benefits.

All of the developers of office suites have promised CD versions, but the only ones available so far are the various flavors of the Microsoft Office product. All these vendors say they will keep their promises, but right now most are dealing with changing their packages' installation routines and determining what additional information, if any, should be on the CD versions.

One business-application vendor, Corel Corp., has promoted CD-based applications for years and put all kinds of additional material on the CD versions of its software. For instance, the latest release of CorelDRAW (Version 5.0) includes 825 fonts, 22,000 clip-art images, and 100 high-resolution photos on three CD-ROMs. While Corel offers a version that includes floppy disks of the application itself, that version is more expensive.

Providing additional fonts is one thing, but really extending the application is another. Lotus 1-2-3, Release 4.0: Multimedia Edition is a

CD-ROM version with a far more sophisticated help engine than that found in the standard floppy disk version. This engine includes tutors and help screens incorporating graphics and animation, as well as extras such as Lotus's ScreenCam utility. Microsoft Multimedia Works, CD version, adds more help to its popular low-end integrated application. Such efforts are few and far between, however, and most seem to emphasize flash over substance.

CD-ROM-based applications do involve some complications and compromises. You'll still probably want to install the main part of an application on your hard disk because it's much faster than a CD-ROM drive. Still, 600MB is a lot of capacity for something that effectively replaces the floppy disk in terms of software distribution.

Developers have always found something to do with extra capacity. Extensive help systems, animated tools, and additional fonts and clip art are just the beginning. □

company is responsible for an entire line of superlative classical CD-ROMs (sold through Microsoft), including Multimedia Schubert: The Trout Quintet, a disk that represents the pinnacle of Voyager's series so far.

Schubert's lyrical quintet is a masterpiece that requires no introduction, but this disk manages to illuminate the music without stepping on it or boring the user. Most of the credit goes to music critic Alan Rich, who does an excellent job bringing Schubert's music to life.

Though other classical music CD-ROM titles often come off as dry or disorganized, Rich's homespun eloquence strikes the right chord, conveying his obvious enthusiasm for the quintet and instilling in the listener a new appreciation for this subtle piece of music. The material is well written and interspersed with lively quotes and anecdotes that prevent it from slipping into mere pedantry.

Highlights of the disk include articles

and slides that take us through 1819 Vienna and Schubert's short life. It also has an intriguing close reading of the work, complete with a performance by Elisabeth Leonskaya and the Alban Berg Quartet. \$79.95; Microsoft Corp., 800-426-9400, 206-882-8080.



Circle 447 on reader service card

The Voyager Co.

● Poetry in Motion

"Poetry's always been said to be a private hidden art, not appreciated," said Charles Bukowski. Poetry in Motion successfully dispels this myth by turning poetry from something read alone at home or in a library into something heard and seen on a PC.

Filmed by Ron Mann, Poetry in Motion contains 24 contemporary poets reading from their work. Additional interviews are included for most of the au-

thors. Although the video plays in tiny windows, the readings bring the works alive, revealing intonations a solitary reader might not otherwise notice. The poets range from the famous (Allen Ginsberg) to the relatively unknown (Chris Dewdney) to those more widely known for their music (Tom Waits and the late John Cage).

Voyager has made the user controls on this disk as unobtrusive and flexible as possible, with sound-level and playback buttons neatly hidden behind the words and images. \$29.95; The Voyager Co., 800-446-2001.



Circle 477 on reader service card

The Graphix Zone

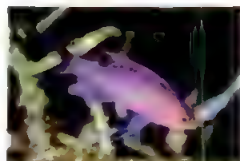
● ♀ Interactive

Beyond guessing how to pronounce Prince's new legal name—♀—this disk will leave you wondering: Is it a game? Is

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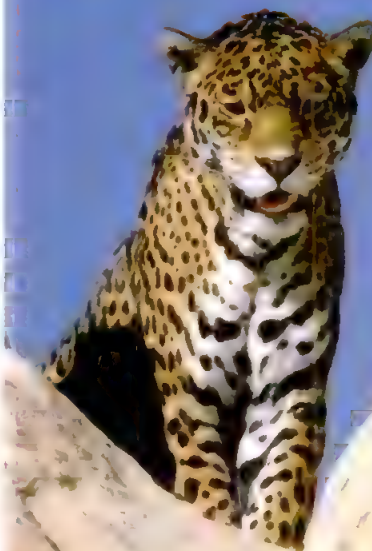
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All Corel Professional Photos can be exported for use in any PC or Mac graphics, paint or DTP software package. CorelDRAW's PHOTO-PAINT module, available in CorelDRAW 3, 4 and 5, provides an assortment of photo-editing tools to alter and manipulate photographs, along with the ability to add a variety of artistic effects and filters.



Enter the Corel \$2,000,000 World Design Contest and win! (September to March)
To receive a fax: 1-613-728-0826 ext. 3080, Document #1004. To leave a message: 1-613-728-0826 ext. 1609

CIRCLE 020 ON READER SERVICE CARD



Part game, part puzzle, ♣ Interactive offers users with MPEG playback hardware the ability to play the pop star's videos full-screen.

it an aural puzzle? Or is it a musical experience? The answer is that it's all of these and more.

Decked out in lush graphics, ♣ Interactive takes you into ♣'s imaginary boudoir, library, music studio, and private club. Throughout, you pick up clues to play videos and collect pieces of the ♣ symbol. The disk contains four full-length music videos, including two new songs: "Interactive" and "Endorphin Machine." The sound quality doesn't match that of a standard audio CD, but this music exemplifies his playfulness and ingenuity.

The music studio has a karaoke version of "Kiss," and in the private club Eric Clapton, Little Richard, George Clinton, and Miles Davis opine about the Symbol Man. Even if you think ♣'s music has never been on the cutting edge, this CD-ROM opens new doors for popular music and multimedia. \$59.95; The Graphix Zone, 800-828-3838.



Circle 478 on reader service card

Microsoft Corp.

• Microsoft Multimedia Stravinsky

Not all symphonic music has a calming effect. Stravinsky's *The Rite of Spring*, for example, caused a riot when it was first performed in 1913. Ever since then, audiences have found this seminal composition interesting but often difficult. On Microsoft Multimedia Stravinsky: The Rite of Spring, UCLA music professor Robert Winter manages to make *The Rite of*

Spring much more accessible.

Employing an array of multimedia techniques, Winter offers insights and brings a cohesion to Stravinsky's famous work that listeners might not otherwise discover. There's an aural tour of the orchestra, notes on Nijinsky's ballet, a biographical sketch of the composer, and even a game.

Relatively sophisticated classical music buffs will appreciate Winter's close analysis, which takes you through Charles Dutoit's Montreal Symphony Orchestra performance note by note and instrument by instrument. \$79.95; Microsoft Corp.,

800-426-9400, 206-882-8080.

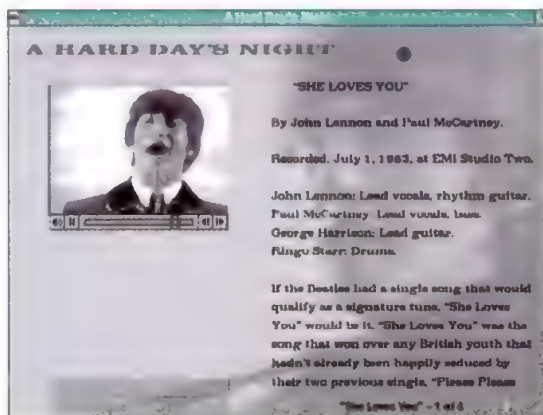


Circle 447 on reader service card

The Voyager Co.

• A Hard Day's Night

Little did Richard Lester realize in 1964 when he began filming *A Hard Day's Night* that it would influence rock videos 30 years later. In case you haven't seen the Fab Four's movie in a while, this Voyager disk shows what an impact the movie and the band have had on subsequent generations. Furthermore, this full-length digitized version of the Beatles movie is an excellent history lesson for kids who think Pearl Jam invented rock and roll.



A young John Lennon performs and cavorts in the Beatles' *A Hard Day's Night*, with bios and the original script.

Coupled with the movie, which plays best in a small, 2- by 2.75-inch window, are Beatles biographies, a lengthy commentary, a photo library, and the original

script. Extras include the movie's original trailer (replete with screaming prepubescent girls), two of Lester's early films (a short and a clip from a feature), and, of course, all the movie's songs. \$39.95; The Voyager Company, 800-446-2001.



Circle 477 on reader service card

Interactive Publishing Corp.

• Beethoven's 5th

Perhaps no music is more recognizable than the opening strains of Beethoven's Fifth Symphony, but this exploration will enhance your appreciation of its grandeur. Beethoven's 5th: The Multimedia Symphony includes video clips of musicians, a section on the instruments, and the entire score, with a performance by the Zagreb Philharmonic under Richard Erdlinger. This well-rounded disk should pique your interest in the Fifth beyond da-da-da-dum. \$59.95; Interactive Publishing Corp., 800-472-8777.



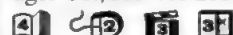
Circle 468 on reader service card

The Voyager Co.

• I Photograph to Remember

I Photograph to Remember is Latin American photographer Pedro Meyer's exquisite black-and-white homage to his parents. Told in his own images and narration, this

work brings into the home on a single disk what many museums can't achieve in an entire exhibit—more personalized contact with the artist. \$39.95; The Voyager Co., 800-446-2001.



Circle 477 on reader service card

Medio Multimedia Inc.

• World Beat

World Beat is a musical sojourn around the world. It's packed with music and video clips, articles, and interviews. The graphics are lively, and the music's never dull. There are three narrated guides and a discography with nearly 2,000 listings. From Afoxe to Zydeco, World Beat covers over 150 musical styles, explaining the his-

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tory of each form and its influence on contemporary genres. \$59.95; Medio Multimedia Inc., 800-788-3866.



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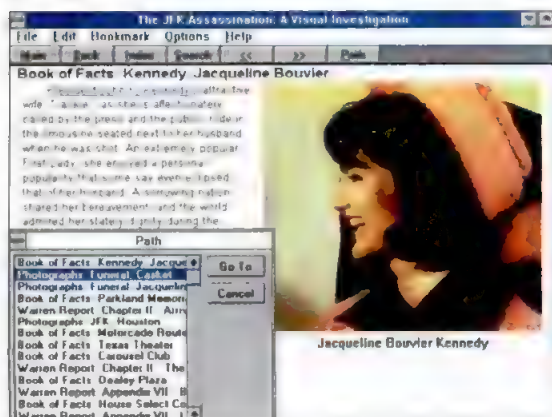
History

REVIEWS BY RUBIN RABINOVITZ

Sony Imagesoft

• The Haldeman Diaries

Okay, H.R. Haldeman may not be at the top of your most-admired list. Nevertheless, *The Haldeman Diaries: Inside the Nixon White House* gives a compelling, behind-the-scenes view of the Nixon administration from its times of triumph through the Watergate events.



JFK Assassination combines text and visual material for a wide-ranging overview of its subject.

As White House chief of staff, Haldeman was in a position to record numerous historical and personal details that are essential reading for anyone studying the Nixon presidency. Along with the full text of Haldeman's 1,521-entry, 2,200-page diary, the disk includes Richard Nixon's presidential logbook and 2,000 pages of related documents. Other items of interest are a 120-page letter Haldeman wrote to Jim Neal—the attorney who prosecuted him—proclaiming his innocence (the letter was never mailed) and a prefatory note by H.R. Haldeman's wife, Jo, describing how the diary came to be written.

The program's textual material, accessible through a search engine and hyperlinks, is supplemented by 850 pho-

tographs and more than an hour of Haldeman's own White House home movies, edited down from more than 27 hours of footage. This program is a great example of how a CD-ROM can be more fun and more useful than a book. \$69.95; Sony Imagesoft, 800-922-7669.



Circle 484 on reader service card

Medio Multimedia Inc.

• JFK Assassination

JFK Assassination: A Visual Investigation is more than a good history program; it's a model for how such programs should be put together. The written material includes the full text of two books on the Kennedy assassination—*Crossfire*, by Jim Marrs (the basis of Oliver Stone's film *JFK*), and *The John F. Kennedy Assassination: A Complete Book of Facts*—as well as the Warren Commission Report.

All of the text is easily accessible: You can use an index, a retrieval engine, or a copious array of hyperlinks to find material on the events of November 22, 1963. There's a lot of material here; for example, a search on *Parkland* leads to 137 references to Parkland Memorial Hospital.

JFK Assassination comes with 30 minutes of full-motion, full-screen video clips documenting the assassination, including the Zapruder film and other assassination eyewitness films. There are 22 computer-animated depictions of key events, showing such details as bullet angles, and an indexed photo library. Different portions of the program present biographical facts about President Kennedy, the events in Dallas, conspiracy theories, and the aftermath of the assassination. Regardless of your theories about the Kennedy assassination, this disk will inform and entertain you. \$59.95; Medio Multimedia Inc., 800-788-3866.



Circle 458 on reader service card

Compact Publishing Inc.

• Time Almanac of the 20th Century

There's no time like the present. *Time Almanac of the 20th Century's* 2,000 articles, 500 photos, and 40 minutes of video—all of good quality—provide a colorful decade-by-decade introduction to recent history. Narrated photo essays such as "Russia, the Death of the Dream" compare the U.S.S.R. of the 1930s to the disintegrating Soviet Union of the 1990s.

Time Almanac of the 20th century also contains maps, graphs, a time line, statistical tables, 12 photo essays on key 20th-century figures, and extensive coverage of all presidential elections since 1924. Additional material includes *Time* "Man of the Year" stories and original cover art since 1927, and *Newsquest*—a game to test your knowledge of 20th-century history. There's a great deal of essential information here for those interested in recent history. \$69.95; Compact Publishing Inc., 800-964-1518, 202-244-4770.

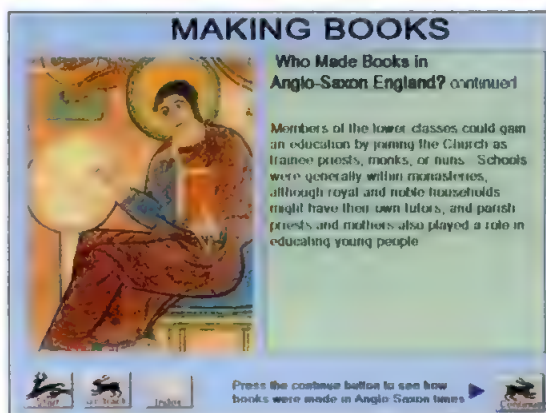


Circle 486 on reader service card

Cambrix Publishing

• The Anglo-Saxons

Recent discoveries have helped us learn more about life in early Britain. *The Anglo-Saxons*, developed in cooperation with the British Museum, conveys this information in a most attractive way. You can listen to Anglo-Saxon music, tackle Anglo-Saxon riddles, look at pictures of



Beyond including the texts of books from early England, *The Anglo-Saxons* describes how books were made in that era.



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Windows Sources, Experts' Pick, June 1994

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Computer Shopper, Top Choice, April 1994

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imaginary beasts, learn about the lives of British kings, find out about life in the monasteries, and get suggestions for places to visit if you're planning a trip to England.

You'll find fascinating illustrations of relevant artifacts, weapons, and manuscripts from the British Museum's extensive Anglo-Saxon Collection and other collections. The Anglo-Saxons also features quizzes based on the included material. Anyone studying medieval history, art, and architecture will not only learn a great deal from this program but will enjoy using it. \$59.95; Cambrix Publishing, 800-992-8781.



Circle 487 on reader service card



Knowledge Adventure's Isaac Asimov Science Adventure II features a reference screen with linked text and pictorial boxes.

coaster acceleration to planetary orbits to a pulley demonstration. It also features several games.

The central mode of the program is its reference screen, where text panels, pic-



Beyond Planet Earth's Solar Gallery is the jumping-off point for videos and still pictures of the planets.

tures, a time line, and a globe are displayed. With a click of a button, you can switch the text panel from adult to child mode, which contains less information and an easier vocabulary. All areas are hyperlinked to other topics.

Isaac Asimov Science Adventure II has a highly graphical interface, which actually is often counterproductive. The icons are very cryptic, making user navigation difficult. The initial area, for example, is a 3-D lobby in which all the icons are pictures hanging on the walls. It's attractive but not very intuitive. Nevertheless, this is a wonderful program for introducing children to the world of science. Their parents can learn a lot as well.

\$69.95; Knowledge Adventure Inc., 800-542-4240, 818-542-4200.



Circle 489 on reader service card

The Discovery Channel

• Beyond Planet Earth

As its name implies, Beyond Planet Earth focuses on astronomy and, more specifically, the solar system. The opening screen branches to four areas: The Planetary Theatre, The Solar Gallery, Space Experts, and Mission to Mars.

The first area has five short videos culled from The Discovery Channel on fascinating topics such as "what happened to the dinosaurs," which explains the currently fashionable theory that their extinction was due to a cosmic collision. The most extensive and impressive component of the disk is The Solar Gallery, which includes a very educational series of stills from space shuttle flights and snapshots of the solar system.

One of the best features of the Gallery is a series of slide shows about each of the planets using photographs taken by NASA. Also included here is a discussion of moons and an introduction to astronomy beyond the solar system. There's even a discussion with four astronomers about a possible mission to Mars in the next century.

As reference material, Beyond Planet Earth is not the best CD-ROM you can find. But if you and your children want to learn about the solar system in a most engrossing way, then Beyond Planet Earth is certainly worth your while. \$49.95; The Discovery Channel, 301-986-0444 ext. 5880.

As reference material, Beyond Planet Earth is not the best CD-ROM you can find. But if you and your children want to learn about the solar system in a most engrossing way, then Beyond Planet Earth is certainly worth your while. \$49.95; The Discovery Channel, 301-986-0444 ext. 5880.



Circle 490 on reader service card

Software Marketing Corp.

• Bodyworks

The Windows-based Bodyworks, Version 3.0, is a superbly designed, comprehensive anatomy reference with wonderful supporting multimedia. From a button bar or menu you choose one of

Science

REVIEWS BY BARRY SIMON

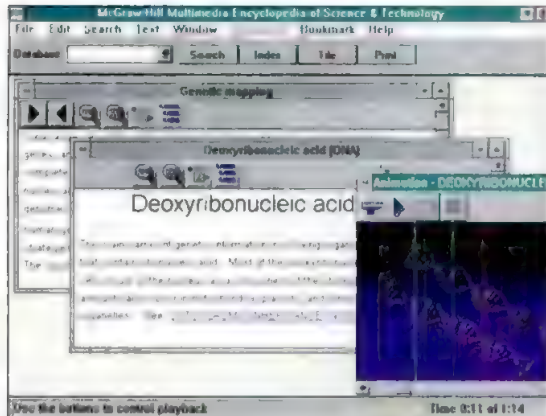
Knowledge Adventure Inc.

• Isaac Asimov Science Adventure II

Isaac Asimov Science Adventure II is noteworthy for its spectacular computer graphics and the high quality of its articles, which are based on Isaac Asimov's *Chronology of Science and Discovery*. Although coverage of the material is not very deep, the disk embraces a wide range of topics and includes a myriad of slick animation demos, from roller-

the top-level body systems: skeletal, muscular, nervous, cardiovascular, respiratory, digestive, sensory, lymphatic, endocrine, or genitourinary. The window then shows the appropriate diagram; you can focus on individual organs by clicking either on the diagram or on an adjacent scrolling list.

Click on the mouth in the skeleton, for example, and a close-up view of an open mouth appears, complete with teeth, tongue, and epiglottis. There is a



The McGraw-Hill Multimedia Encyclopedia of Science & Technology's interface lets you browse with hyperlinks and easily run animations.

text description with hyperlinks to other articles and a glossary. The clear color diagrams (over 140) are supplemented by 14 3-D models and 37 videos and animations.

The 3-D area has a couple of nice surprises. The models can be shown as wireframe, smooth, or angular. All can be rotated, even the simple 3-D models which are redrawn in real time as you move them. Among the multimedia movies included on the CD-ROM are the brief "A Firing Synapse," the mildly disgusting "Chewing and Swallowing," and the inspiring and surprisingly complete "Childbirth."

Lessons and tests are also included. This is an ideal program for high-school students and others who are interested in anatomy. \$69.95; Software Marketing Corp., 800-364-5451.



Circle 491 on reader service card

McGraw-Hill Inc.

● McGraw-Hill Multimedia Encyclopedia of Science & Technology

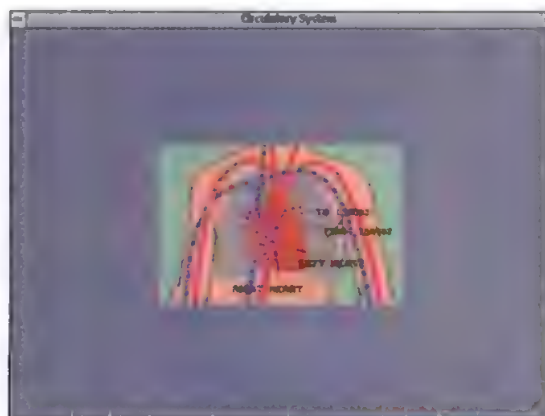
The McGraw-Hill Encyclopedia of Science & Technology has become a standard reference source for everyone from college students to professional scientists. The disk version is filled with the same quality information written by distinguished scientists, and its

powerful search engine will make you wonder why you ever had to bother searching through the massive tome for particular words or subjects.

The best part about this disk is the ability to browse with hyperlinks; the product uses a multiwindowed interface that keeps prior articles in view. It also includes 39 animations and about 500 illustrations that enhance the product but are not outstanding. The biographic list is noted for its glaring omissions (for example, Pierre Curie, Richard Feynman, and David

Hilbert are missing), but the glossary is very good.

This disk won't dazzle you with multimedia pyrotechnics, but you'll love the ability to conduct hyperlink searches



The Mayo Clinic Family Health Book includes detailed diagrams, such as this one of the heart.

through such an important reference. \$900 through October, \$1,300 thereafter; McGraw-Hill Inc., 800-233-1128, ext. 235.



Circle 492 on reader service card

Science for Kids

● Simple Machines

Simple Machines' subject matter—the inclined plane, lever, screw, pulley, and wheel—is rather prosaic compared with many other disks in this review, but it conveys a real understanding of the material rather than the trivia-contest information so common in many educational titles.

Unlike the material, the presentation is anything but dry. Simple Machines' underlying metaphor is of children traveling across the globe to learn about machinery, and it features colorful animations, enlightening demos, and insightful quizzes.

It's hard to imagine making a discussion of how machines work fun and fascinating, but Science for Kids pulls it off. \$199 (teacher's edition, \$289); Science for Kids, 800-572-4362.



Circle 493 on reader service card

Expert Software Inc.

● Expert Astronomer

Expert Astronomer is a cornucopia of delights for the astronomy fan. It includes a planetarium that lets you see how any part of the night sky looks and over 500MB of stunning pictures and engrossing information, with 40 minutes of entertaining videos. For astronomy buffs, this is the CD to buy. \$49.95; Expert Software Inc., 800-759-2562.



Circle 494 on reader service card

IVI Publishing Inc.

● Mayo Clinic Family Health Book

Mayo Clinic Family Health Book includes several dozen animations, 500 illustrations, and 90 minutes of narration, but the most important element is the superb 1,400-page book. The pop-up dictionary, hyperlinks between articles, and text-search capabilities take this work far beyond a printed text. The disk also includes a color atlas of human anatomy. \$69.95; IVI Publishing Inc., 800-754-1484.



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Circle 491 on reader service card

Knowledge Adventure Inc.

● 3-D Body Adventure

3-D Body Adventure is intended to provide an entertaining way to turn young students on to anatomy. Its spectacular multimedia demos include 3-D wireframe views and fly-throughs of the heart and other body parts. Two pairs of 3-D glasses that bring the animations to life are included. This is an ideal program for kids of 7 to 12. \$69.95; Knowledge Adventure Inc., 800-542-4240, 818-542-4200.

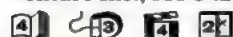


Circle 489 on reader service card

Knowledge Adventure Inc.

● The Discoverers

The Discoverers is based on the IMAX movie, which in turn is based on Daniel J. Boorstin's book about great scientific discoveries. Included is the full 30-minute movie, which looks better than any other you're likely to see on a PC. Children aged 8 to 14 will get the most out of this fascinating CD. \$39.95; Knowledge Adventure Inc., 818-542-4200.



Circle 489 on reader service card

Entertainment

REVIEWS BY DONALD B. TRIVETTE

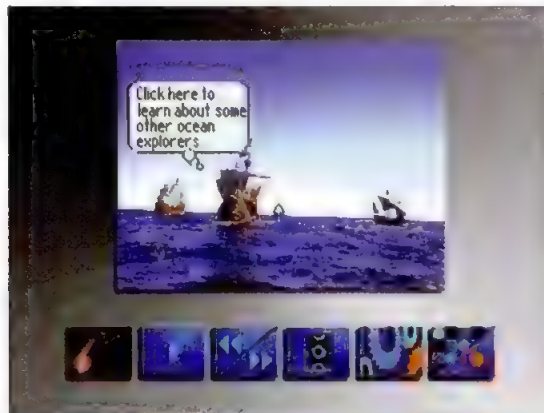
Interplay Productions Inc.

● Sim-City CD-ROM

Whether you're a man, woman, or child, how can you resist being the Mayor of

Sim-City? You plan, build, manage, and maintain a city from the ground up. If you do well, your city will prosper; if not, you'll end up with Sim-Slum.

In Sim-City you build houses, industrial areas, power plants, and roads. As the population grows, you need more utilities, a seaport, a stadium, new commercial dis-



You can pause the movie in *The Discoverers* and jump to reference screens about the subjects covered in the film.

tricts, a park or two, and, of course, higher taxes. A cantankerous collection of city dwellers are always beating on your office door demanding more police officers, fire stations, and affordable housing. To keep you on your toes, the simulator throws in a few surprises—a fire here, a tornado there. Before you know it, the budget is shot and you need money to build a new power plant.

Construction is easy: Click an icon and drag it to the city map. The accompanying sound effects of jackhammers and bulldozers add to the realism. When disaster strikes, a video window opens and you are there. Meanwhile, the audio help feature is constantly nagging: "Put commercial zones near the residential areas. . . Build more affordable housing." Sounds a lot like a city council.

Sim-City is the Lincoln Logs and Lego blocks of the computer generation and splendid entertainment for the whole family. \$50 (estimated price); Interplay Productions Inc., 714-553-6655.



Circle 499 on reader service card

Sierra On-Line Inc.

● King's Quest VI

King's Quest VI: Heir Today, Gone Tomorrow continues the saga of the Graham family, as young Alexander seeks the hand of the fair princess Cassima. Though darker and more ominous than earlier quests, the action and production values nevertheless demonstrate how good multimedia adventure games have become.

A 50MB animated cartoon introduces the quest and ends with Alexander shipwrecked on one of the Green Islands. He quickly learns that Cassima is not only on this very island but betrothed to the wicked Vizier. Of course, adventure and mishap follow as Alex searches for a way to rescue his true love.

The story is full of the witty and bizarre characters that are hallmarks of King's Quest games. There's a participle dangling from a tree, a barking dogwood, a head of iceberg lettuce (you need it to cool a steaming pond), and a delightful group of five animated gnomes, each of which specializes in one



Alexander cautiously approaches a derelict ship in search of clues to help him rescue the lovely Cassima in King's Quest VI.

of the five senses.

Sierra has developed a truly friendly user interface. There is nothing to read and nothing to type in the CD-ROM version; all dialog is spoken by professional actors. And by using the point-and-click interface, even a 6-year-old can move

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Keycode #11BNG



Film clips, audio clips, publicity stills, biographies, and reviews of 20,000 films make Microsoft Cinemania the ideal companion for movie buffs.

through the program with ease. \$79.95; Sierra On-Line, 800-326-6654.



Circle 500 on reader service card

Microsoft Corp.

• Microsoft Golf

Can't get to the golf course this evening? Tee up with Microsoft Golf and hook, slice, drive, and putt your way around 18 holes. It won't do much for your waistline, but it's sure a lot of fun.

The holes are spectacular. No artist's renderings of make-believe links here; instead, the disk offers digitized images of the real thing—either Torrey Pines in



A spaceship balanced on a rocky pinnacle is just one of the odd puzzles you must solve on the uninhabited island of Myst.

San Diego or Number Two at Pinehurst in North Carolina. SVGA graphics clearly show the undulations of the fairways and the textures of the trees with a photographic realism not found in other

golf simulations.

The whoosh of a long drive, the clunk of a ball in the cup, and the splash of water are a few of the authentic sound effects. But the full-motion video is what really distinguishes this multimedia version from other golf games. Every hole has a full-motion fly-over to give you a bird's-eye view of the lay and location of the fairway, bunkers, traps, and green. More video is available in the pull-down window, where a pro gives tips on how each hole is best played. Access Links courses are compatible with

Microsoft Golf, but you won't have the fly-overs and pro tips. \$64.95; Microsoft Corp., 800-426-9400.



Circle 447 on reader service card

Microsoft Corp.

• Microsoft Cinemania

Microsoft Cinemania '94 is a film buff's dream. With still shots, sound bites, cinema history, biographies, 20 full-motion video clips, and reviews of 20,000 films, it's like munching hot buttered popcorn with Roger Ebert, Pauline Kael, and Leonard Maltin. Video clips last from 30 to 90 seconds and are among the smoothest to be found on CD-ROM. About 150 audio clips and 900 movie stills round out the multimedia material.

The software uses a graphical interface in the guise of a remote control. Push the contents button to get a list of films from 99 *Women* to *Zuma Beach*. Double-click a title to see its MPAA rating, running time, awards, and media format.

Every film has a corresponding review, and the more important films feature reviews by several critics as well as complete cast lists. The contents screen lets you filter films by 11 categories, including genre, actor, director, date, and awards.

Hyperlinks abound. While scanning a review of *A River Runs Through It*, for

example, you can click on Brad Pitt's name to call up the actor's photograph and biography. The biography mentions *Johnny Suede*; click on that and you get a review of the 1991 sleeper. Almost everything in Cinemania is interconnected. If you love movies, you'll love Microsoft Cinemania. \$79.95; Microsoft Corp., 800-426-9400.



Circle 447 on reader service card

Brøderbund Software Inc.

• Myst

Thousands of strangely beautiful 3-D scenes, video clips, eerie music, and authentic sound effects combine to make up a sensual if frustrating experience on the Island of Myst. It's frustrating because you are never sure of the plot or what you are seeking; about all you do know is that something has gone horribly wrong on the island and the inhabitants have vanished.

In a kind of sequential slide show, you visit one scene after another to investigate the planetarium, the space ship, the misty forest, the secret tunnels, and the strange mechanisms that dot the landscape. Eventually the rocky little island will give up its secrets and you'll solve the mystery.

If you like a neat plot with defined goals, you will be disappointed. But if you are looking for an original and groundbreaking game, you need look no further than Myst. \$60; Brøderbund Software Inc., 800-521-6263.



Circle 503 on reader service card

Time Warner Interactive

• Aegis: Guardian of the Fleet

For the latest in naval warfare, check out Aegis: Guardian of the Fleet. In it, you take command of the newest class of Guided Missile Cruiser and engage the enemy in a variety of military situations. With three skill levels and over 100 missions, there's work enough to keep you in command for months.

The layout of the ship, Combat Information Center, weapons systems, and radar is as accurate and realistic as securi-

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Keycode #11BNH



Dirk the Daring fights his way from room to room in search of the Dragon's Lair in Don Bluth's classic arcade game.

ty allows. A closed-circuit TV screen in the Combat Information Center shows missiles being launched, and several animated radar screens track hits, misses, and kills. The sound effects and dialog could be more plentiful, but the graphics are right on. \$69.99; Time Warner Interactive, 800-482-3766.



Circle 504 on reader service card

ReadySoft Inc.

• Dragon's Lair

You are Dirk the Daring in Don Bluth's classic animation action game Dragon's Lair. You fight your way from the drawbridge through the snake room, past the Lizard King and other monsters, to the ultimate goal—the Dragon's Lair. Only then can you slay the beast and rescue the fair princess, Daphne.

The CD-ROM incorporates the same laserdisk scenes and sounds that made the original arcade version a megahit more than a decade ago. To guarantee great performance on home systems, the software can fine-tune itself to your video/sound/CD-ROM components, storing information in a small file on the hard disk about how much of each scene to prebuffer during playback. But be prepared: This process can take a while.

Dragon's Lair is a CD-ROM for those who love the challenge of truly fast-paced arcade action. \$69.95; ReadySoft Inc., 905-475-4801.



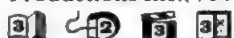
Circle 505 on reader service card

Interplay Productions Inc.

• Star Trek: 25th Anniversary

Star Trek: 25th Anniversary CD-ROM places you aboard the USS *Enterprise* in the role of Captain James T. Kirk with the crew of the original TV series. Your missions alternate between solving intergalactic puzzles and doing battle with Romulans and Klingons. The disk features the voices of William Shatner and Leonard Nimoy. It's a great sequel to the TV

show. \$50 (estimated price); Interplay Productions Inc., 714-553-6655.



Circle 499 on reader service card

Viacom New Media

• Dracula Unleashed

Dracula is stalking blood donors in turn-of-the-century London, and you, as the brother of a victim, must try to stop him. More than 90 minutes of video and 50 minutes of sound lead you from one clue to another. Are you smart enough to put all the pieces of this dazzling multimedia puzzle together before it's too late? \$70; Viacom New Media, 800-877-4266.

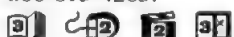


Circle 507 on reader service card

Spectrum HoloByte

• Iron Helix

In Iron Helix, you control a robot aboard a crewless spacecraft on a collision course with a populated planet. Aboard is Iron Helix, the ultimate Doomsday weapon. Your objective is to find the DNA of an officer with high enough rank to allow you to fool the defender robots and reprogram the spaceship's course. Iron Helix contains about an hour of detailed animation. \$72.99 (estimated street price); Spectrum HoloByte, 800-695-4263.

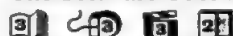


Circle 508 on reader service card

The Software Toolworks

• The Software Toolworks' Star Wars Chess

This is not your father's chessboard. In The Software Toolworks' Star Wars Chess, Luke Skywalker matches wits with the Emperor as a host of other characters—including R2D2, Yoda, and Darth Vader (as a queen)—play supporting roles. Each capture has its own animated wipeout accompanied by sound and music from the *Star Wars* films. \$69.95; The Software Toolworks, 800-283-8499.



Circle 459 on reader service card

Activision Inc.

• Return to Zork

Return to Zork combines an unusually friendly mouse interface with a host of live actors to draw you effortlessly into the action. You quickly forget that you are out to save yet another world (the Underground Empire of Zork) from yet another villain (the IT&L Corp.) and begin to enjoy Return to Zork for what it is: a



The Wizard speaks in the underground multimedia adventure game Return to Zork.

first-class cinematic adventure. \$79.95; Activision Inc., 800-477-3650.



Circle 510 on reader service card

LucasArts Entertainment Co.

• Sam & Max Hit the Road

Sam & Max Hit the Road is a witty trip through the tourist traps of America with the laid-back Sam and the thrill-seeking

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Keycode #11BNJ

The Top 100 CD-ROMs

Max as they search for Bruno the Bigfoot and Trixie the Giraffe-Necked Lady. The offbeat humor and sarcastic one-liners are a refreshing change from usual adventure game fare. \$55.95 (estimated street price); LucasArts Entertainment Co., 800-782-7927, 415-721-3300.



Circle 511 on reader service card

Viacom New Media

• Sherlock Holmes Consulting Detective

Sherlock Holmes Consulting Detective, Volume III, is the latest in the popular series that pits Holmes and Watson against the criminals of London. Use the hour of interactive video—sometimes comically overacted—to interview suspects and witnesses. Listen to the Baker Street Irregulars and scan *The Times* for clues. Once you're sure of your facts, present them to the judge. The disk contains three unrelated mysteries, all of which should satisfy any mystery buff. \$70; Viacom New Media, 800-877-4266.



Circle 507 on reader service card

LucasArts Entertainment Co.

• Rebel Assault

Punctuated with video and original music from the *Star Wars* trilogy, *Rebel Assault* is an arcader's delight. Pilot your skyhopper from training missions in Beggar's Canyon to an encounter with the Death Star. There's no better blend of action, music, sound effects, and dialog—but you may need some hardware tweaking to get it to work. \$63.95 (estimated street price); LucasArts Entertainment Co., 415-721-3300.



Circle 511 on reader service card

Novalogic Inc.

• Comanche CD

Comanche CD is an excellent simulation of the Boeing Sikorsky RAH-66 helicopter gunship. The terrain representation and rich visual detail put Microsoft Flight Simulator to shame. \$74.95; Novalogic Inc., 800-245-4525.

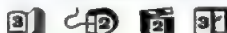


Circle 514 on reader service card

VT Productions

• The Exotic Garden

The Exotic Garden is a fascinating catalog of common and exotic plants and flowers. Information includes Latin names, growing requirements, pests and diseases, propagation, and more than 500 full-color photographs. Nevertheless, this gardener yearns for more photos and more entries. The Exotic Garden includes an interesting time-lapse video called "Why Plants Flower." \$49.95; VT Productions, 408-464-1552.



Circle 515 on reader service card

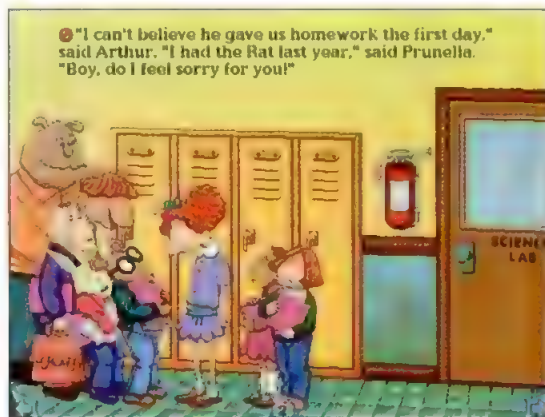
Edutainment

REVIEWS BY GAYLE C. EHRENMAN

Paramount Interactive

• Lenny's MusicToons

Lenny may seem like just another penguin to you, but to your kids, he'll seem like a musical genius. After all, Lenny is no ordinary penguin; he's the bird who can take kids aged 4 and up through the land of MusicToons, where just about anything can happen.



Arthur's Teacher Trouble begins the first day of school, but kids won't have any trouble interacting with this Living Book.

This musical cartoon adventure helps children learn musical skills and concepts through exciting animations, interactive exercises, and fun arcade games. The



Lenny the Penguin is your host for a musical adventure in MusicToon land, where kids can acquire musical skills and make their own music videos.

graphics are vivid, the music pulsing, and the learning deftly hidden beneath the fun.

But your kids won't care about any of that. All they'll care about is staging their own concerts to debut in Lenny's Theatre and producing their own music videos for PTV (Penguin Television). While they're choosing the stars, and types of music for their videos, kids will also be learning about tempo and composing. They can even record their video productions and play them back for their adoring parents.

For more musical fun, kids can try their hands at Pitch Attack—a shoot-'em-up game in which hitting the right key on the keyboard saves the world—or Lenny's Puzzle Book—where unscrambling a musical puzzle saves Lenny's cat from Gonzo

Gorilla, a simian gone wrong.

After Lenny, your kids may even want to practice the piano. \$49.95; Paramount Interactive, 415-813-8040.



Circle 516 on reader service card

Living Books

• Arthur's Teacher Trouble

Third grade can be hell—especially if you have the toughest teacher in school. Thus begins the school year for our hero, Arthur, who discovers not only that he has "The Rat" for a teacher, but that he must represent his class in the schoolwide spelling bee as well.

Kids aged 6 through 10 will quickly



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Keycode #11BNK



The Bug Reference is where all the information on the creepy, crawly critters is stored in Bug Adventure.

become involved in the traumas and triumphs of this animated aardvark as he wends his way through an engaging interactive tale, the second in the Living Books series. Like its predecessor, *Just Grandma and Me*, Arthur's Teacher Trouble offers kids a chance to explore while they read. There are singing and dancing characters to enjoy, sound effects, original music, lots of humor to giggle over, and plenty of beautiful animations that can be launched with a single mouse click.

While they're exploring, kids will be building their reading skills, and they can hear individual words or whole sentences pronounced in either English or Spanish. There's even a printed copy of the book included for times when no computer is handy.

Marc Brown's story is truly delightful, as are the animations used in its telling. This isn't just another storybook in digital format; it's a whole new way for kids to play and learn. \$39.95; Living Books, 800-521-6263.



Circle 517 on reader service card

Knowledge Adventure Inc.

• Bug Adventure

You knew they were creepy and disgusting, but did you also know that aphids are the sweetest-tasting bugs and cockroaches the fastest? You would if you spent some time with Bug Adventure. This latest offering in the Knowledge Adventure line takes kids aged 3 through 8 into the flitting, flying world of bugs—

without bringing the critters into your world.

Kids have six multimedia activities to choose from: the Bug Storybook, where they can read along with a bug tale; the Honeycomb Theatre, where they can watch bug movies with an animated insect audience; the Bug Reference, the heart of the program and where the study material is housed; the identification games Can You Find Me? and Who Am I?; and the 3-D Bug Basement, where they can don silly glasses to view full-screen bug images.

Each of these areas is just a mouse click away, thanks to an amusing and intuitive graphical interface. (One of the highlights is a flyswatter used for returning to the main menu.) There's lots of learning to be had here, but kids will just think they're having fun.

You may be repulsed by the videos and 3-D pictures, but chances are good that there's a budding entomologist in your midst who would really benefit from a Bug Adventure. \$69.95; Knowledge Adventure Inc., 818-542-4200.



Circle 489 on reader service card

Humongous Entertainment Inc.

• Putt-Putt Goes to the Moon

Sometimes sequels are every bit as good as the originals. Such is the case with this latest adventure for Putt-Putt, the talking purple car who made his debut in Putt-Putt Joins the Parade.

As the latest title suggests, our pal Putt-Putt winds up on the moon—thanks to a freak accident at a fireworks factory. His little friend, Rover (an abandoned lunar-terrain vehicle), and their adventures together will keep kids aged 3 through 8 clicking and laughing from start to finish.

Like the first package in the series, this is an animated adventure game that encourages kids to click every object they come across. Some clicks will activate witty animations, such as a rocket

launching, while others will help kids acquire the pieces they need to build the rocket that will transport Putt-Putt and Rover back to Earth. Along the way, your kids will be treated to beautiful animations, fun sound effects, and talking characters—including some two-headed ice cream peddlers and assorted other Moon People.

This may seem like just a game, but while kids are pointing and clicking, they are developing motor skills, as well as problem-solving abilities. They're also learning about tolerance and cooperation, but you don't have to tell *them* that. \$49.95; Humongous Entertainment Inc., 206-485-1212.



Circle 519 on reader service card

Grolier Electronic Publishing Inc.

• Prehistoria

Dinosaurs may get all the glory, but they weren't the only creatures roaming prehistoric Earth. This disk, devoted to all forms of early life, provides a multimedia look at everything from flying lizards with wing spans wider than World War II fighter planes to dinosaurs no larger than chickens.



Learn about the many life forms that shared Earth with the dinosaurs in Prehistoria.

The package provides more than 60 minutes of multimedia content spanning 500 million years of natural history. The material is arranged in five easy-to-access areas: the Gallery, the Creature Show, the Time Tracker, Classifications, and the Grolier Museum. The Gallery offers groupings of similar prehistoric creatures, while the Creature Show lets



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COVER STORY
The Top 100 CD-ROMs

you zero in on your favorites through full-color illustrations and detailed text describing the characteristics of each animal. The Time Tracker allows you to search for particular types of creatures in any of 11 geological eras, while the Grolier Museum is where you'll find narrated videos and audiovisual essays on paleontology, prehistoric life, and more. To make it even easier to find that certain Diprotodon (a rhinoceros-size marsupial resembling a wombat), there's also a classification list.

Kids aged 10 and up will find that researching has never been easier—or more attractive. \$69.95; Grolier Electronic Publishing Inc., 800-285-4534, 203-797-3530.



Circle 446 on reader service card

7th Level Inc.

• TuneLand

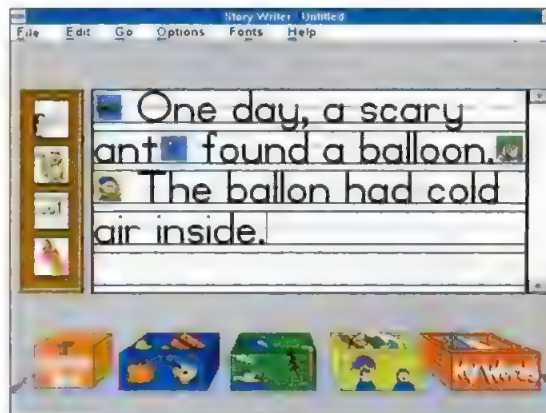
For a musical adventure that will delight kids aged 3 through 12, pay a visit to TuneLand. In this fully animated game of hide-and-seek, your goal is to locate Li'l Howie (the cartoon alter ego of Howie Mandel), who will carry you to the next of eight farm scenes. Along the way, you'll be entertained by familiar children's characters, such as Jack and Jill, who perform song-and-dance routines, tell jokes, and make you laugh out loud.

Everything here is kid-friendly, from the multitude of hot-spot animations to the more than 40 fully orchestrated children's songs you find with a click. There's even spoken help for young players who can't figure out what to do next. In addition,



Follow and sing along with Li'l Howie as he journeys through the wittily animated barnyard world of TuneLand.

tion, there's the TuneLand Jukebox for playing all the game's songs, which include such popular favorites as "This Old Man" and "Bingo."



Kid Works 2's Story Writer is where budding Hemingways can create their own tales; later, they can add pictures and hear the stories read aloud.

Charming animations, high-quality music, and a sense of humor make this one a treat for kids of all ages. \$49.95 (estimated street price); 7th Level Inc., 214-437-4858.



Circle 521 on reader service card

Microsoft Corp.

• Microsoft Dinosaurs

It seems as though everywhere you look there's a dinosaur CD, but few are as attractive as this one. Behind Microsoft Dinosaurs' stone-carved interface is some of the best-organized, most accessible prehistoric trivia around.

The disk is arranged into four main areas: Atlas, Families, Timeline, and Index, any of which can be used for tracking down the dinosaur of your dreams. In addition, you can take a guided tour or watch a dinosaur movie; both provide a good means of getting your feet wet.

What makes this disk such a winner, though, is its extensive use of hypertext linking. Almost everything you click on is a hot spot; some clicks will take you to related topics, while others will launch spoken pronunciations of tricky names. And for the trading-

card fanatics, there are Fact Cards that present statistics on dinosaurs instead of designated hitters. About the only thing missing is a full-text search engine.

\$79.95; Microsoft Corp., 800-426-9400, 206-882-8080.



Circle 447 on reader service card

Davidson & Associates Inc.

• Kid Works 2

Buy your children Kid Works 2 and they'll have no excuse for not being creative. Combining a paint package with a word processor and text-to-speech capabilities, Kid Works provides the perfect environment for kids aged 3 and up to try their hands at writing and illustrating their own stories.

Kids compose text in Story Writer, a simple word processor with a couple of unique capabilities: It uses a simple kiddie font for display, and it can substitute icons for many words. Story Illustrator is the next stop on the creativity train; it's here that kids create the pictures to accompany their words, or they can use the paint tools to color in an electronic book. When they're done creating, Story Player will read the masterpiece aloud.

Kids will love the power this package provides, but they may need a little help figuring out how everything works. \$59.95; Davidson & Associates Inc., 800-545-7677.



Circle 467 on reader service card

Simon & Schuster Interactive

• Macmillan Dictionary for Children

This dictionary is a study in simplicity; scroll through the word list or click on "Go To" to find what you need quickly. Each of the 12,000 words has a definition and an audio pronunciation, and each is hot-linked to other words. Kids can make up their own word lists, too, and then print them or use them to play one of three games. There's not much multimedia glitz, but kids aged 7 through 12 will find this indispensable at homework time. \$29.95 (estimated

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street price); Simon & Schuster Interactive, 800-983-5333.

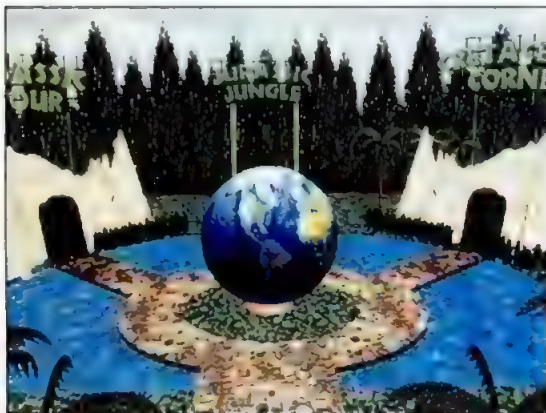


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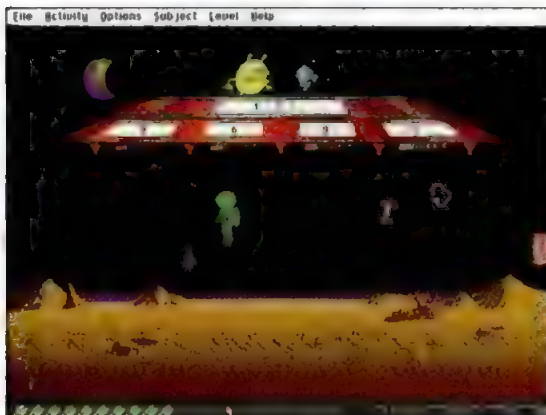
Knowledge Adventure Inc.

• 3-D Dinosaur Adventure

Another dino disk—but with a 3-D twist. Don your cardboard glasses and you'll feel as though you're a tyrannosaurus tidbit. The multimedia special effects are sparkling but sparingly used. The Dino Encyclopedia is a good reference tool, and the



In 3-D Dinosaur Adventure's Create-A-Saurus module, you can design the dinosaur of your dreams.



In the arcade-like Math Blaster, kids must solve arithmetic problems to save the Blasternaut's trusty sidekick, Spot, from the Trash Alien.

theme-park atmosphere is easy to settle into. Kids aged 3 and up will love the 3-D Museum, where they can roam among the Deinonychus and Apatosaurus, and the Create-A-Saurus module, which lets them create wild new creatures. \$79.95; Knowledge Adventure Inc., 800-542-4240.



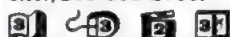
Circle 489 on reader service card

Bureau of Electronic Publishing Inc.

• Twain's World

Buy this one for the text—not the multimedia effects. Twain's World contains the complete works of Mark Twain, including his essays, speeches, and letters, all of which are indexed for searching. The Timeline is a powerful tool for tracking the author's life, and the quizzes are good study tools. There are few video clips, though, and some of the cartoonish animations are downright offensive. \$79.95;

Bureau of Electronic Publishing Inc., 201-808-2700.



Circle 526 on reader service card

Compton's NewMedia

• The Berenstain Bears Learning at Home, Volume 2

These favorite bears are back in a fully interactive journey through their tree house. Here, kids aged 2 through 7 can learn life lessons in home safety, manners, and skills such as reading and number recognition. They may need help navigating through the colorful animations and games, though; guide the youngest to keep them from becoming frustrated. \$39.95; Compton's NewMedia, 619-929-2500.



Circle 448 on reader service card

The Learning Co.

• Operation Neptune

If you can decipher the percentage of unhealthy barnacles in a given area, you may be able to save the world's oceans. This underwater adventure builds pre-algebra math skills as it transports you 20,000 leagues under the sea in a challenging and engaging search-and-rescue mission. There is also some arcade action, so while the going may be tough, it's never boring. \$59.95; The Learning Co., 800-852-2255.



Circle 528 on reader service card

Davidson & Associates Inc.

• Math Blaster

The math fun continues with the latest adventures of the Blasternaut and his sidekick, Spot. In Math Blaster: In Search of Spot, Spot has been captured, and players must solve a series of math problems to free him. There are six difficulty levels and thousands of problems to keep kids aged 6 through 10 busy. The story line is so engaging and the graphics so attractive, solving problems will seem like fun. \$59.95; Davidson & Associates Inc., 800-545-7677.



Circle 467 on reader service card

Brøderbund Software Inc.

• Where in the World Is Carmen Sandiego?

Kiddiedom's favorite villain is stealing the world's most famous landmarks and treasures. In this deluxe edition, it's up to you and the Acme Detective Agency to decipher geography, history, and culture clues and put an end to the thievery. There are lots of impressive photos, videos, and audio clips to help you out, but you must first figure out the high-tech interface. \$60; Brøderbund Software Inc., 415-382-4400.

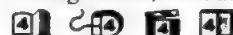


Circle 503 on reader service card

Living Books

• The New Kid on the Block

Another winner in the Living Books series, this disk explores not a single story but a collection of poems from noted children's writer Jack Prelutsky. Readers click on words to launch some wickedly inspired animations. The poems and animations are so funny, readers aged 6 through 12 won't be able to help but laugh their way through this joyous introduction to poetry. \$39.95; Living Books, 800-521-6263, 415-382-4600.



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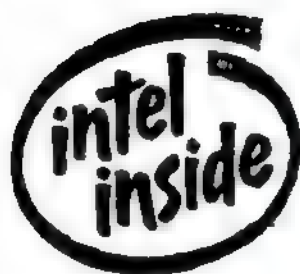
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hrs:mins

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IBM ThinkPad 755Cs (DX4/75) TFT	5:00
Toshiba T4800ct (DX4/75) TFT	5:30
IBM ThinkPad 500 (486/slc) mono	6:30
IBM ThinkPad 350C (SL/25) passive	8:50
Previous record for 486 mono	12:07
NEW RECORDS:	
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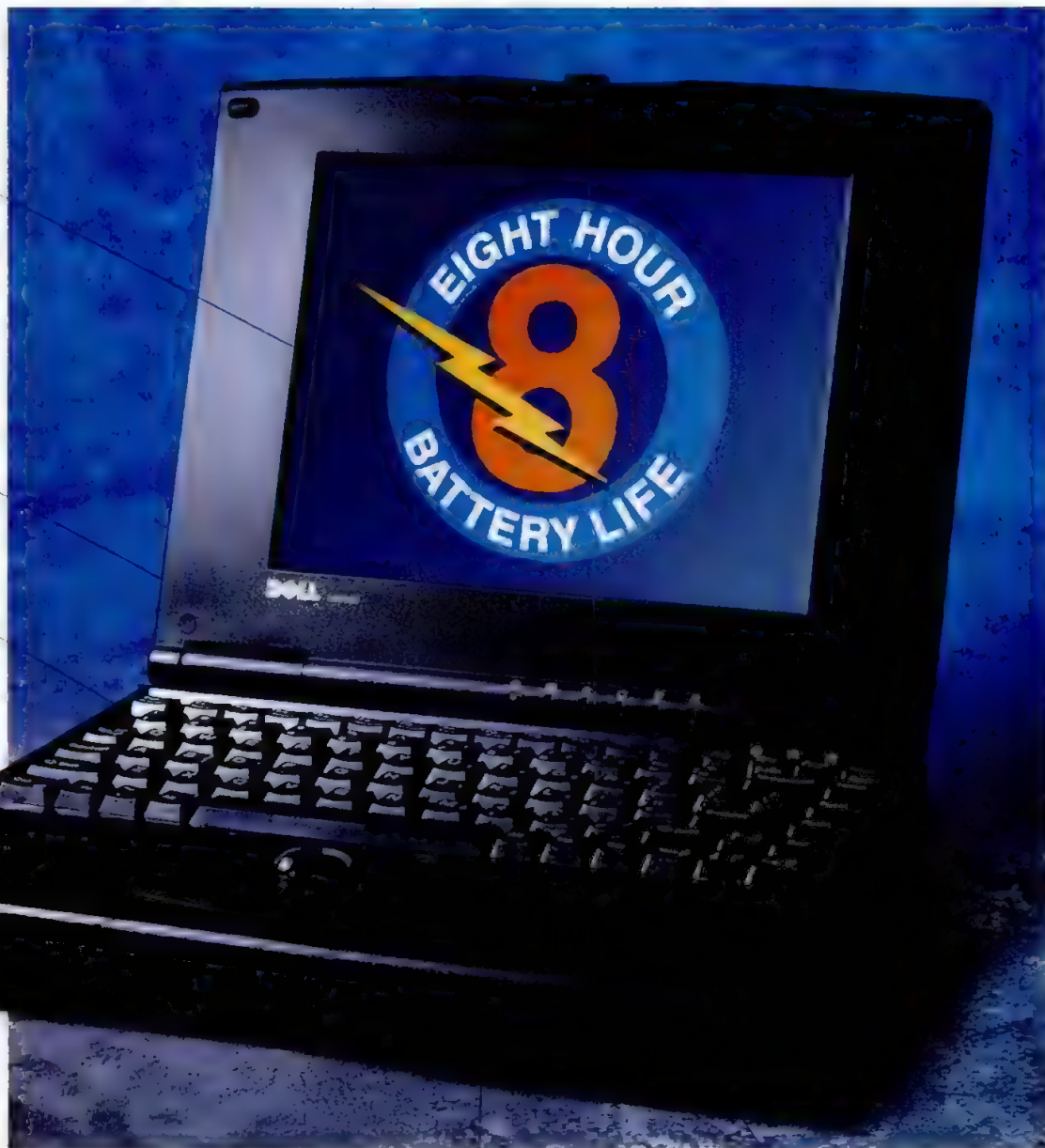
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By Don Willmott

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An annual subscription (four issues) costs \$59.95, and the single-copy price is \$19.95. To order, call 800-787-9677 (mention priority code 4G00) or 303-447-9330, or fax 303-443-5080. □

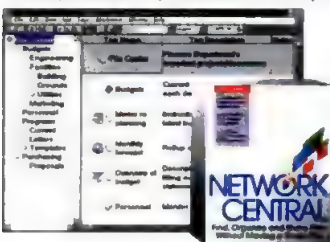
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Even the youngest computer user will quickly discover that pointing and clicking produces hilarious results in **Just Grandma and Me**.

There's nothing educational about poking the sleeping animals at the Probe and Poke Pet Shop, or putting various objects up the giant nose, but the interface is a study in simplicity and blowing out the birthday candles will keep little ones busy for hours. \$39.95; The Voyager Co., 800-446-2001.

Circle 477 on reader service card

Living Books

• Just Grandma and Me

Age becomes Grandma. This Mercer Mayer tale, the first in the Living Books series, is as popular with the 3-through-8 set today as it was when it made its 1992 debut. It's already a CD-ROM classic.

Little ones can't get enough of Little Critter and his grandma, or the scores of animations that launch with a click. Older kids will enjoy reading along in English, Spanish, or Japanese; one disk includes all three versions. \$39.95; Living Books, 800-521-6263, 415-382-4600.

Circle 517 on reader service card

The Software Toolworks

• The San Diego Zoo Presents... The Animals!

You may not be able to smell the animals, but you'll be able to learn far more about them from this disk than you would on a trip to the zoo. Text, photos, and videos combine to present a wealth of information on animals and their habits and habitats. The videos are not of the highest quality,

but the interface is fairly intuitive, and there's a spoken help section. \$59.95; The Software Toolworks, 415-883-3000.

Circle 459 on reader service card

Microsoft Corp.

• Microsoft Complete Baseball

Baseball season may be winding down, but the thrill can last all winter thanks to this multimedia reference. Microsoft Complete Baseball has a full history of the game, player biographies, and an almanac laden with statistics, as

well as multimedia clips. Fantasy-league aficionados can subscribe to Microsoft Baseball Daily (\$1.25 an issue), a baseball newspaper delivered via modem. \$79.95; Microsoft Corp., 206-882-8080.

Circle 447 on reader service card

The Software Toolworks

• The Software Toolworks Presents Capitol Hill

Don't just write your congressman; *be* him with this political simulation game. Video, animations, and illustrations help users play congressperson while they choose a staff and learn everything from how a bill becomes a law to how to balance a budget. \$49.95. The Software Toolworks; 800-234-3088, 415-883-3000.

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Paramount Interactive

• Busytown

Kids aged 3 through 7 will feel at home in this familiar world, based on characters created by children's author Richard Scarry. All their favorite characters are here, encouraging them to participate in learning activities that range from pumping gas to controlling the wind. There are three levels of play to choose from, lots of delightful animations to explore, and an original musical score. If you don't have fun in Busytown, you just

don't know how to have fun. \$49.95; Paramount Interactive, 415-813-8040.

Circle 516 on reader service card

Sanctuary Woods Multimedia Corp.

• It's a Bird's Life

In Shelley Duvall's *It's a Bird's Life*, a group of exotic birds journeys from Los Angeles to the Amazon rain forest and back in a digital storybook that is ambitious in scope and modest in animation. The illustrations are beautiful and the story and games engaging for kids aged 3 and up. \$39.95; Sanctuary Woods Multimedia Corp., 415-578-6340.

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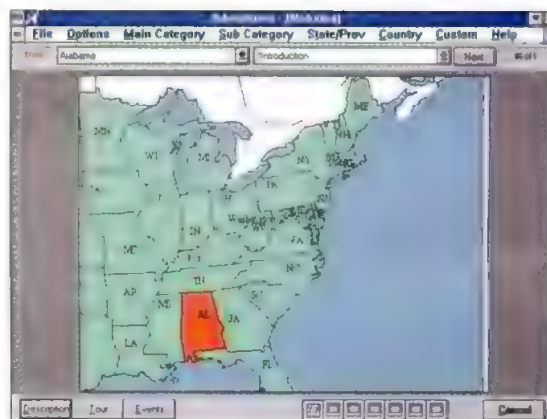
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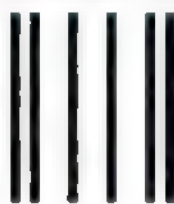
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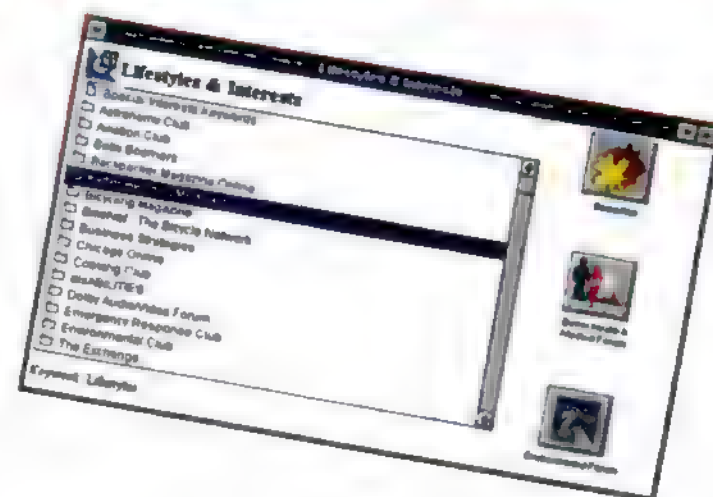
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find some of the activities, festivals, and events occurring in a particular month.

You can also use the search feature to generate a list of specialized activities. Select those adventures classified as "difficult" and you'll get a list of nine excruciating vacations, including climbing Mount McKinley, trekking at nosebleed altitudes in Nepal, and rafting the Futaleufú River

and the cremation ritual in Nepal are two of the more offbeat attractions.

Astonishing Asia has 30 minutes of digital video and 600 color photos set to appropriate music. Some of the topics use slide-show presentations instead of video. Astonishing Asia may not be for everyone, but those interested in Asia with a taste for the occult will be quite—well, astonished. \$49.95; InterOptica Publishing, 800-708-7827.



Circle 540 on reader service card

Claris Clear Choice

• From Alice to Ocean

From Alice to Ocean documents Robyn Davidson's extraordinary camel journey from Alice Springs, Australia, across the expanse of the outback to the Indian Ocean. Directly addressing the viewer, Davidson describes the hardships and dangers of her yearlong journey. The armchair

traveler can interrupt at any time to view maps or photographs, or to select questions from an interactive menu.

Although the trip took place 15 years ago, the chronicle CD of Davidson's journey first appeared two years ago when it was bundled with 500,000 Apple CD-ROM computers and became a best-seller; the multiplatform disk was released last November.

The CD-ROM is bundled with a beautiful 200-page book filled with color photographs. The disk, however, contains many more photos than the book, all of which are of great quality. This is a fascinating chronicle of a remarkable journey. \$69; Claris Clear Choice, 800-325-2747.



Circle 541 on reader service card

MediAlive

• Asia Alive

Asia Alive is a multimedia guide to Australia, China, Hong Kong, Indonesia, Japan, Laos, Malaysia, New Zealand, the Philippines, Singapore, South Korea, Taiwan, Thailand, and Vietnam. The disk includes 37 maps, 30 videos with regional music, and 500 color photos that cover

countries, cities, sights, activities, and customs. It's the content, not the multimedia, that makes this disk worthwhile. \$49; MediAlive, 408-752-8500.



Circle 542 on reader service card

MediAlive

• Europe Alive

Europe Alive, the European travel-guide companion to Asia Alive, covers Austria, Belgium, France, Germany, Great Britain, Ireland, Italy, the Netherlands, Portugal, Spain, Switzerland, and Scandinavia. Though there are plenty of video clips of these locales, you'll get much more satisfaction from the information provided. \$49; MediAlive, 408-752-8500.



Circle 542 on reader service card

Deep River Publishing Inc.

• Everywhere USA Travel Guide

Everywhere USA Travel Guide uses an interface similar to Adventures' interface, but it has a database that is more than twice as large. Two CD-ROMs—one for the East and one for the West—feature more than 3,000 U.S. attractions captured in 6,000 color photos and 80 minutes of promotional videos. There's a playlist for the videos and a state-by-state slide show to pique your interest. \$59.95; Deep River Publishing Inc., 207-871-1684.



Circle 539 on reader service card

Aris Entertainment Inc.

• New York, NY

This is an entertaining collection of 100 color photographs—each with a short caption—that can be displayed on-screen in either large or small formats. In addition, there are 25 10-second video clips of landmarks like the Statue of Liberty, the Brooklyn Bridge, and Rockefeller Center. It's a video picture book, ideal for those who prefer to experience New York from the safety of their own homes. \$29.95; Aris Entertainment Inc., 310-821-0234. □



Circle 545 on reader service card



From Alice to Ocean is the real-life chronicle of Robyn Davidson's journey across Australia and provides a riveting glimpse of the hostile Outback.

in Patagonia. If those are too tame, touring Hungary on horseback might get your blood flowing.

The disk contains about 2,500 color photographs and 40 minutes of video supplied by state travel departments. For each adventure, there's a written description along with dates, cost, and contact information. About 60 percent of the adventures are outside of the U.S., so this is an ideal CD if you plan on traveling abroad. \$49.95; Deep River Publishing Inc., 207-871-1684.



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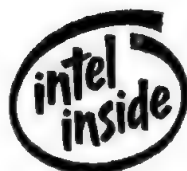
InterOptica Publishing

• Astonishing Asia

Astonishing Asia is part documentary, part travel guide, and part Ripley's Believe It or Not. This is not a guidebook; it is, rather, a strange trip for the armchair traveler.

You access the adventures by country or by any of nine themes. Some of the themes—death rites, stimulants, rituals, and medicine—conjure up images of the mysterious East, while others—such as sports, religion, and festivals—are more conventional fare. Lengthy video clips of the Monkey God Festival in Hong Kong

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DEVELOPER DATABASES

Serious Solutions

The latest developer databases for PCs set new standards for power and data-integrity support, and they're easier to use than ever.

By *Sal Ricciardi*



It used to be that only expensive and complicated relational database management systems had the kind of bulletproof data-integrity and security features needed for true production applications. But not anymore. Sophisticated features such as database-based data-integrity enforcement and robust security have finally made it to the PC database. For developers, this means ensuring more secure data with less low-level coding—a boon by any measure.

At the same time, user interface de-

IN THIS REVIEW

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sign and built-in productivity enhancers have matured to the point where even professionals can use them to their advantage. Part of this advancement has come from products that exploit the Microsoft Windows GUI more efficiently. Other improvements are the result of better underlying software engines. All in all, the best of today's databases do more of the work for you than ever before.



REVIEW CRITERIA

The ten database management systems we reviewed can all be used for developing custom database applications in corporate or production environments. To select products for this roundup, we began by surveying database vendors to identify which DOS and Microsoft Windows products they positioned as suitable for developer use. We narrowed the list to products with concurrency controls for multiuser use on a network. We then eliminated any product that hadn't had a significant update since our last roundup (for more information, see "New Blood, New Power," May 11, 1993). We also eliminated SQL database servers and products designed primarily for developing front ends for SQL database servers. (Both of these categories will be reviewed in upcoming issues.) Finally, we picked from the remaining selections those products we felt would be most interesting to the majority of developers.

Our final list includes Clarion Database Developer, Version 3.0, from Clarion Software Corp.; DataEase for DOS, Version 4.53, from DataEase International; DataFlex 3.05 DOS, from Data Access Corp.; dBASE IV, Version 2.0, from Borland International; Microsoft Access 2.0, Microsoft FoxPro 2.6 for DOS (Professional Edition), and Microsoft FoxPro 2.6 for Windows (Professional Edition), all from Microsoft Corp.; Paradox for DOS 4.5, and Paradox for Windows, Workgroup Edition, Version 4.5, from Borland; and R:BASE 4.5 Plus, from Microrim. Three of the

• Microsoft Access, Version 2.0

The race is not always to the swiftest. While database performance is clearly a big issue with developers, the best products should also improve your applications, cut development time, and enforce the integrity of your users' data.

Our Editors' Choice award goes to Microsoft Access, Version 2.0. Access's sophisticated interface, design tools, and help Wizards make it suitable for everything from developing multiuser systems to printing mailing labels. Under the

hood, Access delivers the strongest set of engine-level data-integrity features we saw. Other high points include live editable queries, support for SQL as a query language, and a clean database model where tables, forms, reports, and

reviewed products—DataEase, DataFlex, and R:BASE—are also available in character-mode OS/2 versions. We were unable to identify any other non-SQL OS/2 developer databases.

We also looked at a late beta version of Borland's upcoming dBASE for Windows (see the sidebar "Almost Here: dBASE for Windows"). We discuss features of Borland's soon-to-be-released Paradox for Windows 5.0 and dBASE 5.0 for DOS

sachusetts, 1990). In simple terms, the relational model emphasizes a disciplined approach to data management based on a sophisticated set of mathematical rules and on enforcing the accuracy and integrity of the information stored in a database.

Some vendors have adopted a less formal and ultimately less useful definition. To them, a relational product is simply one that can draw information from, or *relate*, two database tables based on a common field.

You can't assume that a product that calls itself *relational* has any of the beneficial features outlined in Codd's relational model. For example, the relational model calls for a certain level of support for making sure the information in your database remains correct and complete. The model says you should be able to declare integrity rules to the RDBMS, and they should be stored with the database and enforced globally. Yet a number of the products we looked at—dBASE IV and Microsoft FoxPro for DOS and FoxPro for Windows, for instance—don't support this type of integrity enforcement.

The good news is that three of these products—Microsoft Access, Paradox for Windows, and R:BASE—come much closer to the relational model by provid-

Don't assume every product that calls itself relational offers the benefits of the Codd relational model.

in the reviews of the currently shipping products.

WHAT'S SO RELATIONAL?

Many of the products in this roundup go by the *relational* moniker, but you should consider what vendors mean when they use that term. Ask a database expert for a definition and you'll get the formal answer: A relational database management system (RDBMS) is one that supports the principles and guidelines defined in Edgar F. Codd's book *The Relational Model for Database Management, Version 2* (Addison-Wesley Publishing Co., Reading, Mas-

Our Contributors: SAL RICCIARDI and JOE SALEMI are contributing editors of *PC Magazine*. CRAIG M. BOBCHIN is a journalist and ARTHUR PERLEY is a database consultant. STEPHEN W. PLAIN is a frequent contributor to *PC Magazine*. THOMAS MACE was the associate editor in charge of this story, and JAY MUNRO was the project leader.

applications are stored together. Access performed in the midrange on all our tests but was not beaten by any product with comparable integrity support. Overall, Access is a model citizen on a single workstation, on a multiuser file server, or as a client/server front end.

An honorable mention goes to Borland's Paradox for Windows, Workgroup Edition, Version 4.5. Object-based underpinnings and friendly tools promise efficiency once you've mastered its complex event model. We look to the pending release of Paradox for Windows, Version 5.0, to improve performance and ease of use.

ing significant database-based data-integrity support. And you *want* the rules stored with the database and enforced automatically by the database engine. That way, integrity is ensured no matter how the data is accessed, whether interactively, through importing, or through a custom program. These products also supply built-in referential integrity enforcement, which is critical for maintaining the glue that connects your tables (see the sidebar "Does Your Database Have Integrity?").

SMART HELP

The use of smart help modules such as Microsoft's Wizards is a broad industry trend, and many vendors are racing to incorporate some form of this technolo-

gy under a catchy name. Only a few of the ten products we reviewed contain successful implementations, however. Microsoft Access, for example, comes with a blizzard of Wizards that pop up to ask you a series of questions and then generate the appropriate object based on your responses.

While these helpers are ideal for end users, don't discount their importance for professional developers. For instance, Microsoft Access's Wizards make generating buttons and combo boxes for forms—including the code behind them—a breeze. And FoxPro's Screen Wizard, for example, generates a complete application with just a few keystrokes. Both dBASE for Windows and Paradox for Windows 5.0 will include Borland's Experts when they ship.

It is no coincidence that the biggest ease-of-use enhancements turn up in the Windows products. Microsoft Access and Paradox for Windows allow you to draw joins graphically between tables, making it easier than ever to define the relationships and see at a glance how all of your tables connect. These products point to the future of application development, where you will supply code to respond to events made possible by on-screen interface objects such as buttons. Database applications of the future will clearly be graphical, event-driven, and object-oriented, even though many of the products we reviewed still stand squarely in the old procedural world.

HIGHLIGHTS

Developer Databases

DATA-INTEGRITY support has never been better in databases, but individual products vary widely in what they offer. Some give you substantial engine-level support for features such as primary-key enforcement, restrict/reject, and even cascading update and delete. Others offer little or none of this. You can write code to enforce the rules, but letting the database do it for you is easier.

THE MOVE TOWARD WINDOWS seems inexorable despite the large number of

character-based offerings still available. DOS products still deliver strong performance and useful tools, but our evaluations show Windows products on the cutting edge in engine design and ease-of-use features. With Microsoft FoxPro, Paradox, and soon dBASE available on both DOS and Windows platforms, developers should make a feature-by-feature comparison.

SQL CONNECTIVITY is key when corporate data is involved. Many databases can connect to SQL back ends

CORPORATE FRONT ENDS

A number of the reviewed products can open doors to client/server computing. For example, both Microsoft Access and Paradox for Windows are well suited to be SQL front ends. Microsoft Access works with ODBC-compliant SQL data sources, while Paradox for Windows uses Borland's SQL Link drivers to work with SQL databases from Borland, Microsoft, Oracle, and Sybase.

Microsoft FoxPro for DOS and FoxPro for Windows come with add-on libraries that enable access to ODBC (Open Database Connectivity) SQL databases, but this capability is less integrated than the front-end support in Microsoft Access and Paradox for Windows.

JUDGING PERFORMANCE

Our benchmark tests revealed big differences among the products, which ranged from the blazingly fast to the distinctly pokey. But two factors that affect performance may not be readily apparent in the benchmark test results. The first is that database management systems that support data integrity necessarily incur overhead that other products do not. So faster is not necessarily better overall.

The second is that the performance of your own applications is heavily dependent on correct database design, so time invested in learning design principles is time well spent. The reviews that follow will help you pick the best product to realize that design.

transparently via ODBC or native drivers so that you can develop applications for them. Some products also support SQL for interactive queries against local or server data.

OUR SPEED TESTS taxed the reviewed products far beyond the demands of most real-world environments to reveal the toughest. But the fastest products aren't necessarily the ones with the most advanced database-engine features. Don't forget the data-integrity side of the equation.

Clarion Software Corp.

• Clarion Database Developer

BY STEPHEN W. PLAIN

Clarion Database Developer, Version 3.0, delivers attractive enhancements to a unique DOS-based programming environment that has long enjoyed a cultlike following. The product offers powerful 4GL code generation and a centralized Data Dictionary to speed up the development of database applications. It also boasts an impressive programming language, a true compiler with mixed-language support, and a powerful interactive debugger. Clarion is decidedly not for end users; it imposes a steep learning curve. It also falls short in some key areas of database access and connectivity. Clarion was also one of the slower performers on our benchmark tests. A Windows version of the product (currently in development) may address these limitations while enhancing its strengths.

CLARION LANGUAGE

The Clarion Database Developer comprises a language-based integrated development environment (IDE), a professional-quality compiler, a data dictionary manager, and a system of replaceable file drivers that provide database access. The decade-old Clarion programming language, which forms the foundation of the product, was specifically designed for creating business applications and borrows elements from several languages, including BASIC, COBOL, Pascal, and Xbase.

The Clarion language is highly readable and yet offers considerable low-level power. An extensive selection of data types is provided, including several integer, floating-point, and string formats. Clarion also supports the Group data structure (similar to a Structure in Pascal), which can be used to combine several individual variables that can be accessed through a single label.

Since Clarion attempts to be as data-independent as possible, the data-access

Suitability to Task: Developer Databases

The very best database-development software packages offer sophistication and horsepower for addressing a wide range of tasks. Our Suitability to Task evaluations look at the reviewed products from a variety of perspectives. *Power* ratings are based on the products' raw abilities. The *ease of use* ratings indicate how accessible this power is to the user.

The **end user** rating reflects tools and facilities for getting a simple database up and running. We look for clear and understandable installation procedures, an easy-to-use interface, easy database creation, simple navigation and query facilities, and the inclusion of intelligent help modules and useful examples. An easy way to format standard mailing labels is a plus.

The **professional application development** rating indicates how suitable each package is for intensive applications development. We look for full-featured user interface painters, report designers, and other interface development tools. We also judge the power, control, and compatibility of the development language. Data integrity is a key criterion in this roundup. We look for strong data-integri-

ty features at the engine level, the enforcement of a primary key, provisions of data validation, and range checking and rules enforcement. Poor benchmark test performance detracts from this score.

SUITABILITY TO TASK		
	Company Name	
	Power	Ease of Use
End user	POOR	EXCELLENT
Professional application development	FAIR	GOOD
Querying and reporting	GOOD	FAIR
Connectivity	EXCELLENT	POOR

ty features at the engine level, the enforcement of a primary key, provisions of data validation, and range checking and rules enforcement. Poor benchmark test performance detracts from this score.

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ty features at the engine level, the enforcement of a primary key, provisions of data validation, and range checking and rules enforcement. Poor benchmark test performance detracts from this score.

The biggest improvement in the current release is the template-driven Application Generator, which lets you rapidly develop basic applications. Common interface and data-access elements are encapsulated in a standard list of template procedures that serve as application building blocks. As you select various templates, a visual representation of your application is created in a tree format. Each template also pro-

SUITABILITY TO TASK Clarion Database Developer

	Clarion Database Developer	
	Power	Ease of Use
End user	POOR	POOR
Professional application development	GOOD	FAIR
Querying and reporting	POOR	POOR
Connectivity	FAIR	GOOD

level database management is Clarion's Achilles' heel.

Clarion Database Dictionaries are stored as .DCT files. These files can be associated with one or more applications to generate code that defines the database schema, integrity constraints, and validation rules automatically. You build the

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CUSTOMER INFORMATION

Account No: 10-23-495
Name: Jennifer Davis
100 Cranberry St.
Wellesley, MA 02181

Inv. Objectives: Growth
Occupation: Programmer
Birthdate: 15-Jul-68

HOLDINGS SUMMARY

	A	B	Total
Market	Market	Market	
Aero	\$7,000	N/A	\$7,000
Auto	N/A	15,000	15,000
HW	N/A	40,000	40,000
SW	N/A	30,000	30,000
Total	\$7,000	\$5,000	142,000

Pie chart data: Aero (21%), Auto (28%), HW (40%), SW (11%)

ReportSmith interface elements: File, Edit, View, Insert, Format, Tools, Window, Help. New drag-and-drop interface makes building reports easy for end-users. Includes built-in templates for columnar, crosstab, form reports, and mailing labels. They're the fastest way to impressive reports.

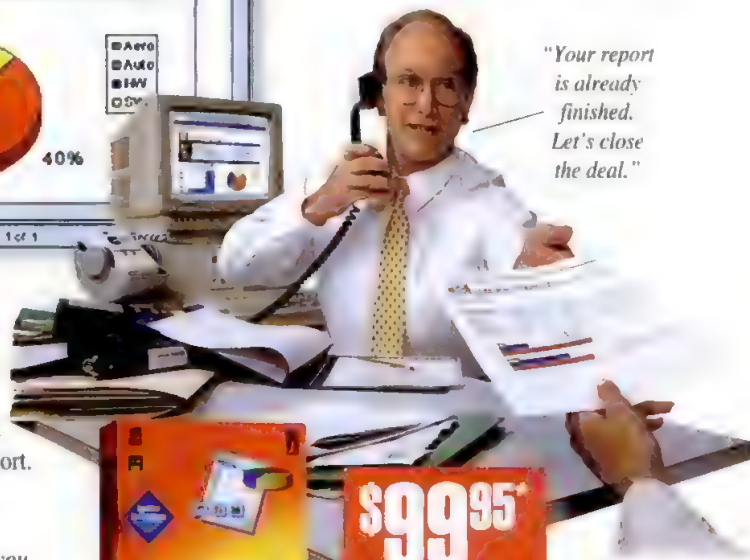
The easiest way to spectacular reports.

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Paradox for Windows - [WorldOptics Order Entry System]

File Edit View Form Record Properties Tools Window Help

Customer

Contact Name: [Loren Niday]
 Telephone: [+44-71-123456]
 Company Name: [The Camera Shop]

WORLD OPTICS

Order

Order No	Date	Total Amount	Status:	Ship via:
2199	1-Jul-94	2,723.00	☒ In Stock	Two day
2266	12-Jul-94	1,235.23	☐ Back Ordered	Ordered by: [Telephone]
2350	3-Aug-94	1,913.55	☐ Discontinued	PO No.: [M1209]

Camera			Filters			Video Camera		
Qty	Unit Price	Total Price	Qty	Unit Price	Total Price	Qty	Unit Price	Total Price
2	1,195.00	2,390.00	2	19.00	38.00	1	1,565.00	1,565.00

Print Invoice **Upload Orders**

Microsoft Word - [WORLD OPTICS.doc]

File Edit View Table Record Properties Window Help

WORLD OPTICS

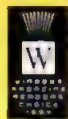
CUSTOMER

Company Name	Address	City	Postal Code
1 The Camera Shop	6322 High Street	London England	SW11 1NN
2 Visuals	35 rue de Turgot	Paris France	75004
3 Computer Ltd	100 Main Street	Chicago Illinois	60601

Sincerely



▲ Paradox for Windows has superior integration with Perfect Office and Microsoft Office applications. Thanks to OLE 2.0, you can place a "live" Paradox table into a Microsoft Word or WordPerfect document and edit the data in place. (Access 2.0 cannot do that.)



February 1994



November 1993



June 1994

◀ Paradox for Windows is the most award-winning Windows database on the market with over 20 major industry awards for excellence.

OK

NEW VERSION 5.0



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The new Paradox® 5.0 for Windows is here, and suddenly managing your business data and building database applications just got faster and easier. You'll be amazed at what you can do with the new tools that let you start fast and do more. For example, 13 new Interactive Coaches quickly teach you how to accomplish any task. The Coaches even let you work with your own "live" data, so you complete your work as you learn. Then there are the on-line Experts™ that guide you step-by-step in creating professional-looking forms, reports, and mailing labels. Even your largest data management tasks will be completed in record time.

Office integration outshines Access

Full client and server support for OLE 2.0 and DDE make Paradox the best database for use with other applications including Perfect Office and Microsoft Office. For example, you can place a "live" Paradox table in a Word document, edit the table in place, and your changes are automatically updated (*Access can't do this*). And Paradox gives you record level locking, that provides enhanced productivity in multiuser environments. (*Access locks up your whole page!*)

Want to increase your workgroup productivity? Paradox's built-in Workgroup Desktop and new Mail Enablement make it easy to publish and subscribe the latest data, using your existing network or e-mail system. This makes it simple to get weekly or monthly updates like sales and expense information.

More speed, developer enhancements, and Client/Server connectivity

New Paradox 5.0 for Windows has been tuned to give you better performance. It stores and retrieves data faster, and delivers answers to queries with more speed than ever before.

Comparison Facts

End-user Features	Paradox 5.0	Access 2.0
Built-in Computer Aided Training	✓	
Experts/Wizards to guide you step by-step	✓	✓
Integrated graphics	✓	
Built-in workgroup and mail capabilities	✓	
Query Filters without query process	✓	
Power-user/Developer Features		
OLE 2.0 client and server support	✓	
Compatibility with applications from previous version	✓	
Visual Data Model Designer	✓	
Transparent connectivity and scalability with database aliases	✓	
Record level locking	✓	
Exchange of data types including Time, Graphic and Autoincrement	✓	
Graphical integrated Development Environment (IDE)	✓	
ODBC compliant	✓	✓
Dedicated high-performance native SQL drivers	✓	

And Paradox 5.0 for Windows has kept developers in mind too. There's a new Integrated Development Environment and more than 300 new Methods and Properties help you develop ObjectPAL™ Windows applications faster. Plus, with Borland's new high-performance native SQL links, Paradox is ready when you are to upsize your applications to the Client/Server environment.

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vides places within the source called Embed Points, where you can add your own code. If you need to customize them even more, Clarion offers a template language that lets you modify the standard templates or design your own. While the standard templates are well designed, they are very poorly documented.

Clarion features replaceable file drivers that let you change data sources with little or no modification to your source code. Drivers for delimited and fixed-length text, Btrieve, dBASE III and IV, Microsoft FoxPro 2.0, and Paradox 3.5 are included in the box, and others are available from the company at an extra cost. There is no support for SQL databases, however. This is a disappointment, since replaceable file drivers are a natural means of scaling LAN-based applications to client/server. The company has plans to add SQL language and data access to a future version of the product.

HIGH-QUALITY COMPILER

One of the most attractive elements of Clarion Database Developer is its professional-quality compiler based on Clarion's TopSpeed compiler technology. Clarion applications can be compiled to .EXE files, and unlike most database systems, which produce pseudo-code, it truly com-

FACT FILE

Clarion Database Developer, Version 3.0



List price: \$995 **Requires:** 286-based PC or better, 2MB RAM, 20MB hard disk space, DOS 3.3 or later **In short:** This impressive database programming tool has a sophisticated language, true compiler, and powerful debugging that will appeal to traditional program-

mers but not to end users. The best new feature is the template-driven Application Generator and its well-designed templates. Shortcomings include lack of high-level query facilities, uninspired benchmark test performance, and poor documentation. A coming Windows version may address these concerns.

Clarion Software Corp., 150 E. Sample Rd., Pompano Beach, FL 33064-9990, 800-354-5444, 305-785-4555; fax, 305-946-1650

522 on reader service card

or .DLL file. The company also sells a DOS extender that lets you create protected-mode applications. The Clarion language is treated like the other Clarion compiler languages such as C, C++, Modula-2, and Pascal, and compiled applications from these languages can be linked directly into Clarion applications. You can also add in-line C code directly into your Clarion source. The Clarion IDE is CUA (Common User Access)-compliant, and your applications can be easily created as such.

Also included in Clarion is the Visual Interactive Debugger (VID), one of the most powerful debuggers you will find in any DBMS. The VID lets you set breakpoints and watchpoints, trace your code as it executes either in real-time or in slow-motion mode, and even disassemble your application to get down to the real nitty-gritty of things. Professional developers who routinely code in C will feel at home with the low-level tools and control that Clarion offers.

The need of developers to work directly with their data is only partly addressed by the product's Database Manager. The Database Manager lets you edit a database file in a tabular format but ignores any integrity rules you have set up in the Dictionary Editor. There is no provision

for ad hoc multitable queries nor any sort of interactive query builder.

The documentation provided with Clarion is unsuitable for such a complex product. While the language reference does a good job of spelling out the parameters of each function call, the tutorial is woefully inadequate. The templates—the heart and soul of the applications-development process—are not even documented in the manuals. In fact, much of the product's documentation is available only in the on-line help system or in README files.

The Clarion Database Developer is a sophisticated system for developing DOS applications, but it hasn't kept pace with its competition. Lack of SQL connectivity, a query optimizer, and interactive tools limit its appeal. The company is currently putting substantial energy into developing a Windows version of the product, now in beta, which it hopes will revitalize interest in this veteran tool.

DataEase International

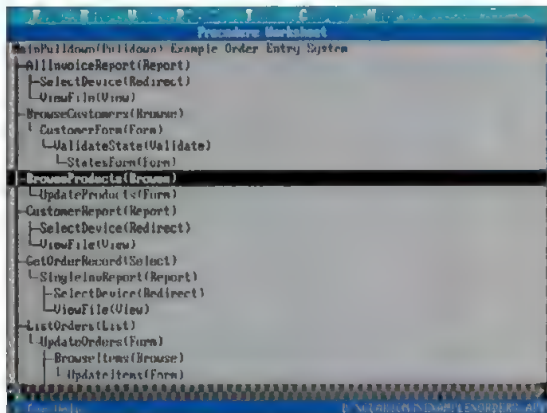
• DataEase for DOS

BY CRAIG M. BOBCHIN

Most database management systems fit into one of two general categories: developer or end user. DataEase for DOS, Version 4.53, falls into the gray area somewhere between the two.

DataEase is a menu-driven system that can lead even the most novice database user through standard database-development tasks. Yet it offers the developer enough power and extensibility to tackle more ambitious projects. Its performance was generally poor on our benchmark tests, though, so it may not represent a strong choice for applications that involve very large databases or high-traffic multi-user environments.

DataEase comes in a variety of flavors. There is a version that requires only 640K of RAM, an extended-memory version reviewed here (which the company recommends for general use), and a character-based version for OS/2. The company also sells an end user-oriented Windows version of the product called DataEase Express for Windows (for more information, see "End User Databases: Balance of Power," June 28, 1994). A Windows version of the current DOS product is also



As you choose templates, Clarion Database Developer's template-driven Application Generator lays out your application in a tree format.

piles to machine code. The standard Clarion package lets you create royalty-free executables as standalone .EXE files, overlayed .EXEs, and .EXEs with DOS DLLs that contain the runtime libraries. You can also optionally compile your application to a runtime library as a .LIB

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Benchmark Tests: Developer Databases

Clear trends emerged from testing these high-end databases, with both versions of Microsoft FoxPro taking the lead overall. But raw performance should be weighed against other desirable features.

How We Tested

PC Magazine Labs tested this year's roundup of multiuser databases using a subset of the AS³ AP (ANSI SQL Standard Scalable and Portable) benchmark tests for relational database systems, originally developed at Cornell University by Dina Bitton and associates. The AS³ AP benchmark tests exercise a wide spectrum of common database operations and simulate both a single-user and an extremely demanding multiuser environment. The test uses four 100,000-row, comma-delimited tables designed to return a known percentage of their values in response to specific test queries.

Each vendor received our test specifications before testing began. Vendors wrote code modules for each test and in most cases created a full application, complete with pull-down menus and status indicators. We held vendors to a one-box solution: Tools or compilers not included with the reviewed product were disallowed. Testing was conducted at PC Labs, where our reviewers worked with representatives from each vendor.

The **Select** test measures how fast each product can execute a single table query that returns a percentage of rows in the table. We perform both numeric and character queries, each pulling a specified range of records using an indexed field. To minimize differences in the way products returned data, we require all vendors to create an ASCII text file containing the return set.

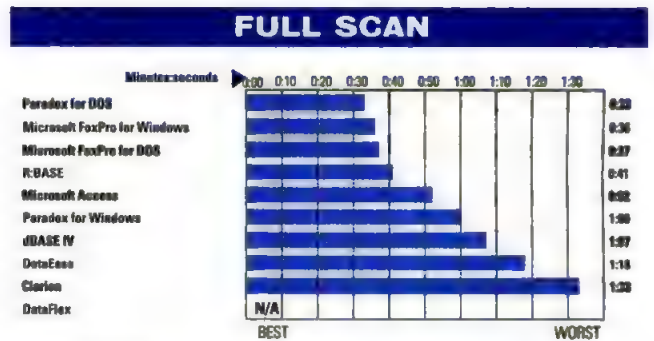
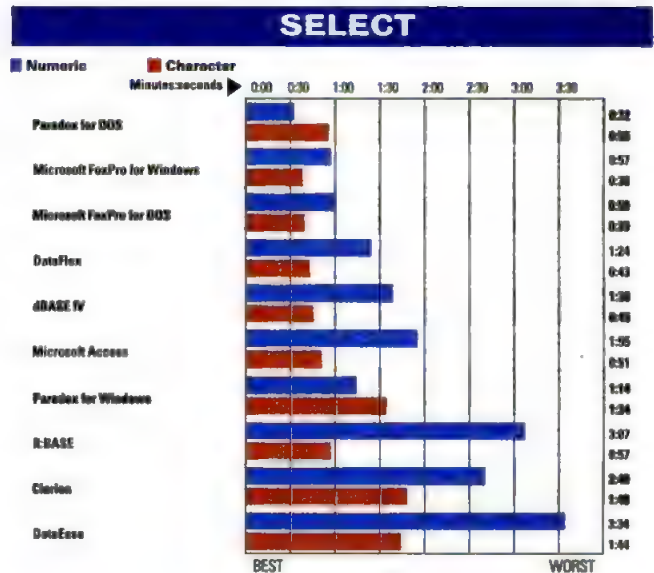
The **Full Scan** test measures the time required to search an unindexed field for a value not present in the table. This represents a worst-case query scenario since the entire database must be scanned. Again, Paradox for DOS and the two FoxPro products came out on top, followed closely by R:BASE. DataFlex does not support an unindexed scan, so its results were invalidated. The company did create a successful, if slow, workaround: The data table was loaded into an EMS memory array and scanned programmatically.

The **Load and Index** test evaluates how quickly each product could import our database and create 13 indexes. The indexes are distributed among four tables with two tables having two indexes each, one table containing four indexes, and the last table having five. The vendors are given the choice of importing quoted or unquoted comma-delimited ASCII or fixed-length ASCII format files.

Microsoft FoxPro for DOS and FoxPro for Windows came out on top, followed by dBASE IV and R:BASE. DataEase finished last with a time of just over 5 hours. Paradox for Windows required a two-step process, first loading the data to a temporary table, then assigning it to the proper data fields in the target table.

Paradox for DOS and both Microsoft FoxPro versions came out on top with times of under a minute. Paradox for Windows' character query times were less than optimal because of its default case-insensitive setting. DataEase's queries were slow because the product defaults to using the first index field.

For the **Update** test, we perform bulk operations consisting of updates, insertions, and deletions (Modify, Append, and Delete). Our Modify test measures the time needed to update the primary key for a 1,000-row range in a table. We measure Append performance by adding 1,000 rows and Delete performance by deleting the 1,000 modified rows. Paradox for DOS finished first, while Paradox for Windows had difficulty with the Modify and Delete



N/A—Not applicable. DataFlex does not support an unindexed scan.

tasks. Clarion and DataEase had the most difficulty with the Append portion of the test because of how they update their indexes.

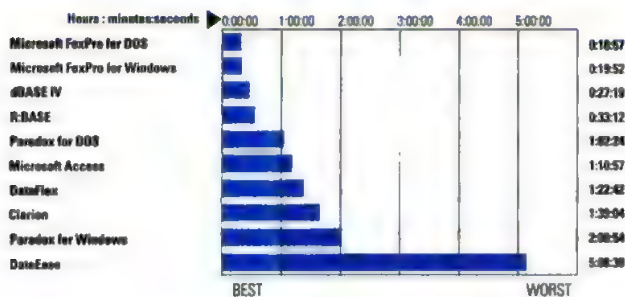
The **Random Read** test indicates the maximum number of concurrent retrievals each package can handle. Each workstation selects a row using a random number from the same table and discards the output to device NUL. Records are accessed in browse mode to maximize concurrency. The test runs for 2 hours and 10 minutes with workstations added at 10-minute intervals in a specified sequence until all 36 workstations are running. Throughput is calculated for each 10-minute interval and expressed in transactions per second (tps). The load is many times what the same number of workstations would produce in a real-world situation.

Microsoft FoxPro for DOS and FoxPro for Windows were the clear winners, each with total throughput of over 3,100 tps. Paradox for Windows also did well at over 1,200 tps, and DataFlex followed with an impressive 1,100 tps. Microsoft Access with Rushmore optimization showed a marked improvement over its performance last year.

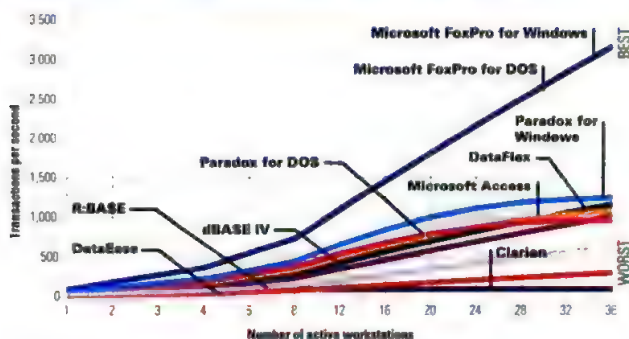
For the **Random Write** test, each workstation randomly selects a record and updates a signed integer field. Like the Random Read test, this test generates a stress far greater than that of a normal 36-user load. The results are widely varied and performance needs to be weighed against the level of data integrity each product enforces. Individual locking schemes also play a big role.

Both versions of Microsoft FoxPro, which offer little in the way of integrity checking, led the group on this test at over 700 tps. Microsoft Access, which

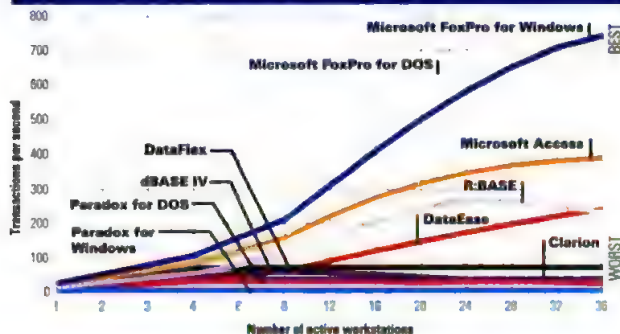
LOAD AND INDEX



RANDOM READ



RANDOM WRITE

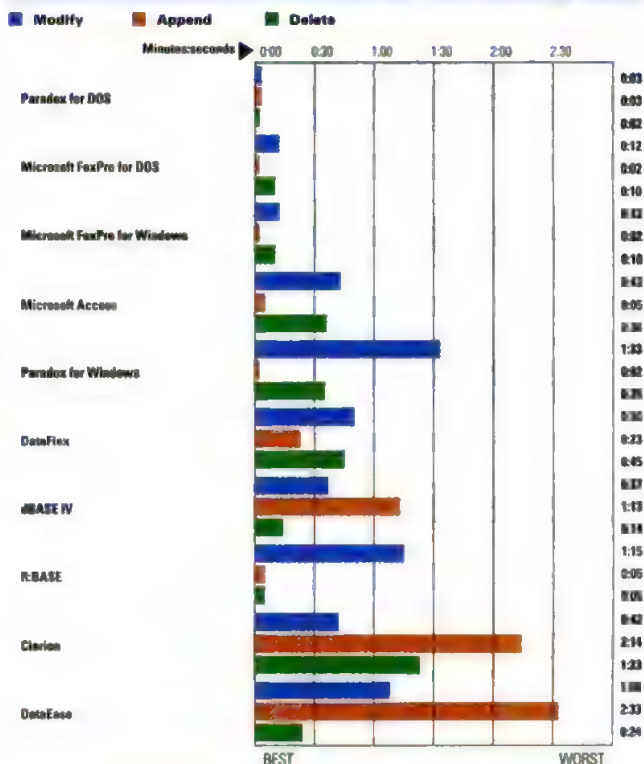


performs extensive integrity checks, came in with an impressive 388-tps score. Clarion's throughput leveled off at 36 tps above four workstations because of its page-locking scheme, and dBASE IV peaked at around eight workstations, slowing as more were added.

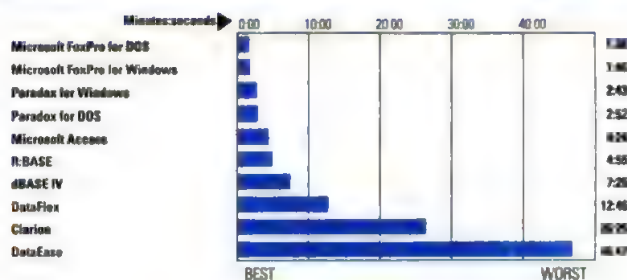
Paradox for DOS and Paradox for Windows both had difficulty because of their proprietary locking scheme. At Borland's request, we also ran modified Paradox for Windows test code that performed updates in small batches rather than as individual requests. This produced up to a five-fold performance increase (these improved results are not reflected in our charts).

The test platform for the single-user test was a Compaq Deskpro 486/33M with 8MB of RAM and a 340MB hard disk. For multiuser tests, the file server was a Compaq Systempro 486/33 with 32MB of RAM and two 2GB Seagate Barracuda hard disks. We tested using a network load of up to 36 workstations, balancing the traffic using two Madge EISA Token-Ring cards in the file server. The workstations were identically equipped Compaq Deskpro 386/16Ns with 8MB of RAM. The tests were conducted using NetWare 3.12 on a 16-Mbps Token-Ring network.

UPDATE



REPORT GENERATION



Each product was installed in a multiuser configuration. We installed and ran the DOS products on the file server, while the Windows products installed on the individual workstations.

For the **Report Generation** test, we use one workstation to produce and print a report while eight other workstations perform the Random Read test in the background to simulate workgroup traffic. A package produces the report from a temporary table built by joining two 100,000-row tables. The test measures the time it takes to generate a 100-row report that incorporates date calculations, minimum and maximum values, subtotals, and totals. The final report is output to an ASCII file.

The two FoxPro products came up on top in under two minutes, followed by Paradox for Windows and Paradox for DOS, with times of under three minutes. DataEase came out the slowest with a time of more than 46 minutes because it defaults to using a single index when generating reports. Clarion's slower time is due to the fact that the product first builds a special index to do the required sorts.—*Analysis written by Jay Munro*

under development, although a release date has not been set.

MENUS OR CODE

DataEase's menus let you accomplish virtually all of your database creation and administration tasks. More experienced developers will like the ability to use Custom Defined Functions (CDFs) that can be programmed in C, assembly language, and other supported languages. CDFs can be useful in extending the feature set of the DataEase development environment, particularly for the creation of custom reports.

Installing DataEase is a simple task; it takes up approximately 4MB of hard disk space including the sample applications and CDF samples. DataEase itself makes no changes to your system-configuration files, although tuning parameters can be entered into CONFIG.SYS. We did, however, have to set up some variables in the DOS environment to get DataEase to run correctly in multiuser mode.

DataEase includes a Virtual Memory File (VMF) system, and you should plan to use it for optimal performance. Once

you have set up a VMF, DataEase is intelligent enough to ignore it if it is not needed, as when you run the program from within Windows. DataEase comes with a .PIF file for Windows use.

INTERFACE AND DEVELOPMENT

DataEase comes with a standard collection of database tools: a screen generator, a menu builder, a report generator, and query-by-form capabilities. Applications development with these tools is generally straightforward.

DataEase displays dynamic menus across the top of the screen and a status line indicating the current assignment of the function keys across the bottom. The menus change based on the operation that you are performing. DataEase has mouse support that gives you point-and-click access to both menu choices and function-key commands that appear along the status line.

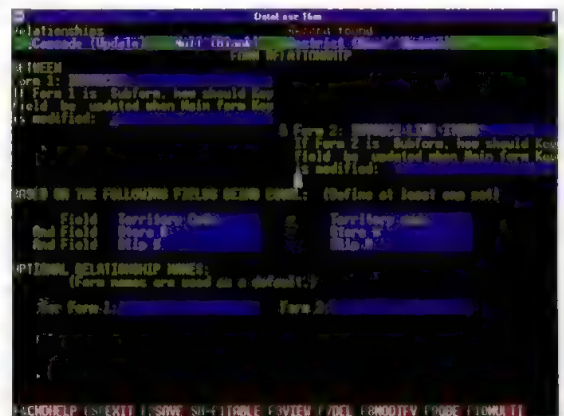
The look of your final applications will be a bit archaic, however. DataEase does not support movable, resizable windows or push buttons; it supports just single modal windows. Creating multitable parent/child forms is easy, however, and you can draw lines and boxes on forms to enhance their appearance.

Table creation occurs at the same time as screen creation: There are no other facilities for creating a table. This can be awkward because each table needs to have at least one screen associated with it that shows every field it contains. You can't use multiple forms to add fields to a table; you must add fields through the master form. If you delete this master form, then you delete the table also. Your application can use multiple forms to add data to a table, however. All forms in DataEase can have multiple pages and can perform calculations if you desire.

DataEase doesn't provide a true data dictionary, but you can set field rules. You can create lookups into other tables, build

pick lists, automatically place an incremental value into a field, perform range checking, and specify that a field be required. A field can also be set to perform a calculation. The database doesn't directly support a primary key, but you can easily create one using the available Unique and Required settings. Referential-integrity features such as restrict/reject and cascading updates and deletes are not natively supported, however.

DataEase uses dialogs to lead you through more complex development steps. For example, when you're setting up links between different database tables, the Relationship dialog prompts you for the table and field names that you wish to join, making it easy to create one-to-one and one-to-many relationships.



DataEase's menu-driven interface makes the package accessible to less experienced users.

DATAEASE QUERY LANGUAGE

DataEase provides a programming/query language called DataEase Query Language (DQL). While not a full-blown programming language, it can be used to create complex reports and data updates. DQL has about 150 available functions and operators and is in large part menu-driven. DataEase guides you through building the code, one step at a time. All options are displayed along the top of the screen; when you select the number displayed next to the suggested option, the operator is added to your procedure. DQL's abilities also extend beyond reports creation. For example, most of the tests for our benchmark tests were written in DQL. For most application tasks, you'll find that it adequately fills the bill.

SUITABILITY TO TASK

	DataEase for DOS	
	Power	Ease of Use
End user	GOOD	GOOD
Professional application development	FAIR	GOOD
Querying and reporting	FAIR	GOOD
Connectivity	FAIR	FAIR

FACT FILE

DataEase for DOS, Version 4.53



List price: \$795 **Requires:** 286-based PC or better, 1MB RAM, 1.5MB hard disk space, DOS 3.3 or later **In short:** An easy-to-use, menu-driven interface makes this tool accessible even to a beginning database programmer, while professionals will find the language and tools adequate for standard applications.

DataEase for DOS offers a fair degree of engine-level support for data integrity. Slow benchmark test performance raises concerns about using the product in demanding multiuser environments, however. This package looks a bit old-fashioned next to flashier Windows rivals, but for speedy development of no-frills applications in DOS, DataEase may fill the bill.

DataEase International Inc., 7 Cambridge Dr., Trumbull, CT 06611; 800-243-5123, 203-374-8000, fax, 203-365-2317

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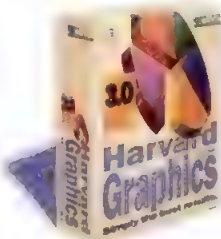
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PERFORMANCE

DataEase was a slow performer on our benchmark tests, finishing last in the majority of cases. The one notable exception was the Random Write test, where it maintained a midrange score even after the maximum number of workstations had been added.

For fast applications development in a DOS environment, DataEase is an easy tool to work with and offers enough power for most standard tasks.

DataEase comes with three reference manuals and a tutorial that includes CFD samples. The documentation also includes a master index that makes it easy to find specific features and commands no matter which book they are located in. The on-line help, however, was often not thorough enough to be useful. You can create your own context-sensitive help for your applications.

DataEase is an easy tool to work with and delivers enough power for most standard tasks. Its menu-driven interface makes it especially accessible to less experienced users. If fast applications development in the DOS environment is a prime consideration and you are not too concerned with adding fancy windows and buttons to your interface, DataEase may be a good choice. For more ambitious tasks or for creating high-performance multiuser applications, you'll probably be better served elsewhere.

Data Access Corp.

• DataFlex DOS

BY CRAIG M. BOBCHIN

DataFlex 3.05 DOS is an efficient, character-based development system with over a decade of history behind it. While not ideal for casual users, it offers a number of features developers will appreciate, including solid visual tools, object-oriented source-code generation, and extensive cross-platform support. It suffers from

Does Your Database

By Sal Ricciardi

The database systems in this roundup differ widely in the number of features they provide for maintaining *data integrity*—that is, the correctness and completeness of the information in your database. Such features are clearly of paramount importance, since the consequences of incorrect information can be severe.

INTEGRITY ENFORCEMENT

Ideally, the DBMS should provide an easy way to declare integrity rules without complex programming. The rules should then be stored with the database and enforced automatically by the database engine. That way, integrity is ensured whether the database is accessed interactively or through a custom program. Some of the products in this roundup, Microsoft Access and Borland's Paradox for

Windows, for example, have excellent support for database-based declarative integrity. Others, such as Borland's dBASE IV, Microsoft FoxPro for DOS, and FoxPro for Windows, have no support at all for database-based integrity and require you to write procedural code to enforce integrity rules. You must then copy that code to every application that accesses the database, and even then an interactive user can still bypass the rules. Some products, such as Clarion Database Developer or Data Access Corp.'s DataFlex, come with application generators that will automatically create the code for you. Still, these packages can't enforce rules at the database level, where enforcement belongs.

PRIMARY KEYS

In a relational database, each table must have a *primary key*—a column or

At a Glance: Engine-Based Data Integrity

	YES ☐ NO ☐	Primary key	Incremental value	Reject/Restrict	Cascading update	Cascading delete	Range checking	Required field
Clarion	☒	☒	☒	☒	☒	☒	☒	☒
DataEase	☒	☒	☒	☒	☒	☒	☒	☒
DataFlex	☒	☒	☒	☒	☒	☒	☒	☒
dBASE IV	☒	☒	☒	☒	☒	☒	☒	☒
Microsoft Access	☒	☒	☒	☒	☒	☒	☒	☒
Microsoft FoxPro for DOS	☒	☒	☒	☒	☒	☒	☒	☒
Microsoft FoxPro for Windows	☒	☒	☒	☒	☒	☒	☒	☒
Paradox for DOS	☒	☒	☒	☒	☒	☒	☒	☒
Paradox for Windows	☒	☒	☒	☒	☒	☒	☒	☒
R.BASE	☒	☒	☒	☒	☒	☒	☒	☒

* DataEase can implement a primary key at the database level via its Unique and Required settings.

some missing pieces, however—the biggest being flexible import or export options to standard data formats and direct SQL connectivity. Its scores on our benchmark tests, while not spectacular, were generally midrange.

DataFlex is available in two separate releases. The normal DOS edition runs in 640K of RAM and does not use extended or expanded memory. The DOS protected-mode edition (reviewed here) uses the DOS/4GW DOS extender, from Rational Systems. DataFlex is also available on a variety of other platforms, including OS/2, Unix, VMS, and Xenix; the compa-

ny claims data and source-code compatibility across all systems. The version we tested also included a runtime module for distributing applications.

DataFlex takes up about 12MB of hard disk space, which includes the sample application files that come with the program. These applications are also useful tutorials that are well documented in the *Getting Started* manual.

INTERFACE AND DEVELOPMENT

Although DataFlex is a character-based system, it manages to assume some of the look and feel of a GUI program. Check

Have Integrity?

combination of columns that uniquely identifies each row in a table. Each row must have one, and it must be unique. Your DBMS should provide support for designating a primary key and should automatically enforce its application.

Access, Clarion, DataEase, Paradox for DOS, Paradox for Windows, and R:BASE all have database-level primary-key support built in. For products that don't, you must write code to make sure every row has a valid, unique primary-key value. DataEase does not support a true primary-key type but lets you implement a similar function at the database level by combining the Unique and Required column attributes.

Access, DataEase, and R:BASE include support for an automatic incremental-value field type, where the DBMS automatically supplies new, unique values. This can be a great convenience when creating a table's primary key.

REFERENTIAL INTEGRITY

When designing a database, you divide your information into many subject-based tables to minimize data redundancy. You then provide your DBMS with the means to connect the data back together again by placing common columns into related tables. In this

way, the values in one table *reference* corresponding values in another (for more information, see "Database Design: Redundancy and Normalization," January 25, 1994).

Keeping these references in sync is what referential integrity is all about. By default, your DBMS should record information about table relationships and automatically reject any operation that would violate referential integrity. For example, if you attempt to delete a customer record when references to that customer record exist, the DBMS should reject the attempt.

Access, Paradox for Windows, and R:BASE natively support this approach—sometimes called *reject* because the operation is rejected and sometimes called *restrict* because operations are restricted to those that do not attempt to violate referential integrity.

A number of alternatives to restrict or reject exist. These include cascading update, where the targets of a reference are automatically updated, and cascading delete, where all references to a deleted row are likewise deleted. The accompanying chart specifies which products support these and other vital data-integrity features at the database-engine level—where those services belong.□

Your applications can use both types or just the CUA menus.

SUITABILITY TO TASK

	DataFlex	
	Power	Ease of Use
End user	FAIR	GOOD
Professional application development	FAIR	GOOD
Querying and reporting	FAIR	GOOD
Connectivity	POOR	POOR

boxes, push buttons, radio buttons, and scroll bars are implemented using standard ASCII characters and are available for use in your applications. DataFlex sports two types of menu systems, CUA pull-down menus and older-style pop-up menus. Most DataFlex screens provide both menu types, and because functions are generally duplicated in both, you can pick either one.

Create applications visually, including data-

base tables, data entry forms, menus, pick lists, and reports. DataFlex is mouse aware, and you can drag and resize screen objects as you work on them, albeit with the coarse granularity of the character-based development window.

DataFlex also provides a basic band-ed-report generator that is accessed through the Query facility. You can pick from a list of open tables and their fields. You can also enter filter and sort criteria and specify groupings. Within the confines of a character-mode system, you have reasonable control over the reports'

▶ FACT FILE

DataFlex 3.05 DOS



List price: \$995 **Requires:** 386-based PC or better, 4MB RAM, 8MB hard disk space, DOS 3.0 or later **In short:** DataFlex 3.05 DOS is an interesting developer's database that offers visual design tools and a source code generator in a character-based DOS environ-

ment. Finished applications are compiled and run from within the environment or distributed with an included runtime version. The DataFlex language boasts support for object-oriented inheritance, and the exhaustive documentation comprising more than 1,500 pages is a plus. Its downsides include limited import or export features and poor connectivity to SQL and other standard databases.

Data Access Corp., 14000 SW 119 Ave., Miami, FL 33186, 800-451-3539, 305-238-0012, fax, 305-238-0017

532 (4) reader service card

appearances. Generated reports can be output to screen, printer, or a file.

Finished applications are automatically converted to DataFlex source code. Code can be generated in one of two styles: object-oriented or procedural. Object-oriented code is the default; the procedural method is used primarily to provide compatibility with older versions of the DataFlex runtime module. You select your desired coding option through a dialog when creating your application.

You must compile the code to test your application, but this is easily done from within the environment. DataFlex compiles to tokenized pseudo-code.

The DataFlex language is a 4GL that is not designed for low-level programming but offers reasonable control for handling DataFlex files. It supports the concept of inheritance, but inheriting from an object involves hand coding, something only the



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manipulation)

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(to guide you)

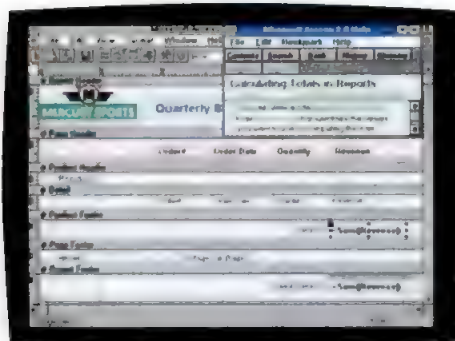
PowerKey™ technology
(for direct access
to existing data)

Lotus 1-2-3 Integration
(for working with 1-2-3)

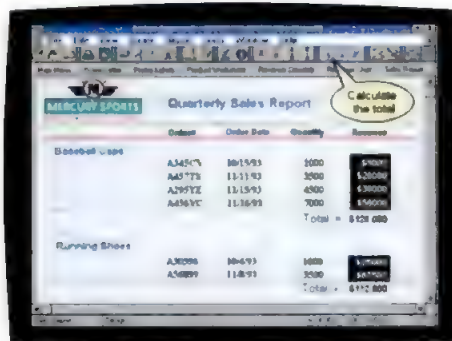
Lotus Notes Integration
(for reporting on Notes data)

X10 speed architecture
(for blazing speed)

Dynamic crosstabs
(for drag and drop analysis)



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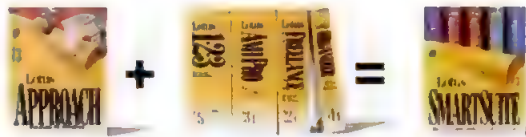
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Almost Here: *dBASE for Windows*

By Stephen W. Plain

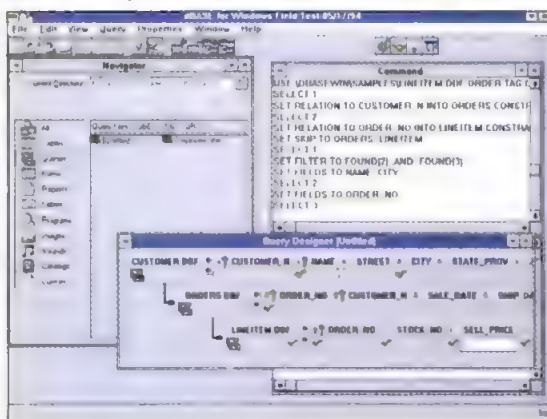
By the time you read this, the long wait may be over. As we went to press, Borland International's dBASE for Windows was nearing completion after years of development. Judging by a late beta release, this product will deliver impressively on the GUI promise with its new power and ease of use. Just as importantly, it seems poised to offer a smooth transition to the Windows platform for current DOS users. dBASE for Windows is compatible with dBASE III+ and dBASE IV code and runs DOS applications entirely as is, albeit in a text-based DOS compatibility window. For migrating existing applications to a true Windows environment, you will be able to use Borland's Component Builder, a conversion application for turning dBASE for DOS formats such as screens and reports into native dBASE for Windows files. (We were not able to evaluate a fully working version of Component Builder for this story.)

In addition to supporting standard dBASE syntax, dBASE for Windows also adds powerful object-oriented extensions. The revamped language, coupled with new visual design tools and a sophisticated database-engine technology, firmly propels dBASE in the direction of rapid application development (RAD) systems and client/server development tools. Like the upcoming Version 5.0 of Paradox for Windows, dBASE for Windows uses the Borland Database Engine to provide connectivity with dBASE, Interbase, ODBC, Oracle 6, Paradox, and Sybase SQL Server databases. Borland's SQL Link for dBASE for Windows is required to access SQL databases but should provide nearly transparent access to SQL tables. You

will even be able to use dBASE navigation commands like SKIP and GO BOTTOM with servers that do not natively support these operations.

NEW LOOK

A brand-new look gives dBASE the benefits of a GUI environment while preserving enough traditional elements



When you build a query in the Query Designer, corresponding dBASE code is streamed to the Command window.

to make DOS users feel at home. Most operations can be performed through the Speedbar and the extremely helpful Navigator. The Navigator is a container dialog box that organizes dBASE files such as programs, forms, queries, sound clips, and labels so that you can easily switch between them. Double-clicking with the left mouse button will execute the file's default run behavior, while double-clicking with the right button will bring up the file in design mode. For example, double-clicking on a .DBF file with the left button will bring up a browse window; the right button will bring up a dialog box for modifying the table's structure.

dBASE for Windows makes healthy use of the right mouse button and tabbed dialogs. The SET command, known in the DOS version for its exhaustive list of parameters, now produces a stylish multipage tabbed dialog for setting program parameters.

Another new interface object, the Command Window, offers a fresh take on the venerable dBASE dot prompt. This window is split vertically into an Input Pane and a Results Pane; you enter commands into the Input Pane, and the responses to your commands stream into the Results Pane. The Command Window maintains an impressive two-way communication with the visual tools. When you create a form or a query, for instance, corresponding dBASE code is automatically generated and streamed into the Command Window in real time. This can be useful for reviewing generated code and for copying snippets into your program files. Conversely, a MODIFY FORM command in the Command Window will bring up the Form Designer just as if you had right-double-clicked on the .WFM file in the Navigator.

The Query Designer provides a graphical QBE (query by example) interface to define queries. Relationships between tables are established graphically by dragging links between table icons and selecting the appropriate fields to join. Selecting fields to be included in the query works like Borland's Paradox for Windows: You simply check off the fields you want and enter search criteria as desired. The dBASE code to execute the query streams to the Command Window when the query is run and can be saved in a .QBE file.

OBJECT READY

By far the most radical enhancement is the incorporation of object orientation into the language. dBASE for Windows is fundamentally object-based, giving you the means to create more reusable and more modular code. Properties of objects are specified using the traditional dot notation, and because objects are memory-variable constructs, you can access any active object from the

Command Window. An Inspect function brings up a tabbed dialog box to browse an object's properties and methods. The dBASE language supports the concept of classes, and 21 standard ones—mostly user interface objects such as browse windows, check boxes, and push buttons—are provided. You can define your own classes from scratch or subclass (inherit) from an existing class. You can define properties and methods for your classes easily by adding Assignment statements and Procedure constructs, respectively, within the class definitions.

While object orientation gives you better code reusability and application control, it doesn't force you to learn a new programming style at once, since the visual tools create class-based, object-oriented code automatically. The product's interactive nature makes it easy to experiment and learn about object orientation while building real applications.

FORMS AND REPORTS

The Form Designer is a state-of-the-art WYSIWYG tool that includes the Form Expert, a help module that generates form source code after you supply the answers to a few questions. After choosing the table or query to base the form on, you select the fields to be included, the layout style, and finally, the visual properties such as fonts and colors. The supported layout styles are browse, columnar, form, and one to many. The columnar layout puts the fields in a single column, while the form layout mimics a paper form with boxes around each field. The browse layout produces a tabular look at the data, and the one-to-many layout produces standard fields for the master table and a browse table for the child records. The resultant object from the Form Expert is a .WFM file in object-oriented dBASE code.

The Form Designer lets you paint objects on the form using either the supplied visual controls or custom

controls, both of which are accessed through the Control Palette. Custom controls can be in Microsoft Visual Basic's .VBX format or in dBASE's native custom-control format. dBASE custom controls—visual controls written entirely in dBASE code that you can place on a form—are powerful examples of code reuse in dBASE for Windows. Creating a dBASE custom control is as easy as writing a class definition and saving it as a .CC file. Then you simply add the control to the Control Palette using a menu command, and it becomes available just like any other control.

The integrated Crystal Reports for dBASE, a custom version of Crystal Computer Services' popular report-writing tool, creates reports and labels. Crystal Reports gives dBASE a sophisticated, flexible WYSIWYG environment for designing banded reports, crosstabs, and labels. A wide variety of graphics formats, including OLE objects, can be inserted into reports, and a long list of standard label formats is included.

Another major addition is the dBASE for Windows Debugger, a separate, easy-to-use program that provides excellent control over program execution. The debugger presents four windows: the Module Window for viewing the source code, the Watch Window for monitoring the value of variables on the fly, the Break Window for displaying any active breakpoints, and the Stack Window for maintaining a list of all calls to external functions or separate source modules.

Not surprisingly, this first release of dBASE for Windows will have a few holes. The compiler won't be out until late this year, and dBASE will be only an OLE 1.0 container application. Performance is still an unknown quantity, since the beta code we tested contained a considerable amount of debug code. Even so, dBASE for Windows should prove to be a sweet reward for many of the 6 million patient dBASE users who've been waiting such a long time. □

expert programmer will want to undertake. All of the tools in DataFlex are written in the DataFlex language, and source code is provided if you want to see how they work.

All DataFlex tools can be run from the DOS command line. Some, like the Browse utility, are standalone executables, while others are DataFlex programs that must be run using the program's DFRUN.EXE utility. Experienced developers may find this quicker and more efficient than loading the full DataFlex program in memory.

DATABASE FEATURES

DataFlex does not have a true data dictionary and cannot enforce data integrity, referential integrity, or a primary key

*A unique feature of
DataFlex is its native
data compression,
which can be tuned by
the user for the desired
performance level.*

at the database level. You need to add these features to your application, where a number of field options are available. You can enforce a Required or Unique field, prevent entry, or specify that a field be filled automatically, for example. You can also set a pop-up pick list or a detail window to appear when a field is entered.

A variety of data types are supported, including alphanumeric, date, memo, and binary. A unique feature of the product is that it includes native data compression, which can be tuned with user-definable parameters for the desired performance level.

DataFlex comes up decidedly short in the area of connectivity, however. There are no import or export facilities except through the exchange medium of ASCII data. It also does not support connections to SQL databases or to any standard database-table formats.

To import an ASCII file, you must

first create an application to import it to, a step that can be easily accomplished using the prompt-driven READ.FLX utility. Once the data has been imported, however, you'll find that you have to create at least one index before you can locate any records. This can be a confusing series of steps that requires you to go through several menus and subsidiary programs in order to create your desired indexes.

HEAVY DOCUMENTATION

On the upside, one of the most impressive aspects of DataFlex is its documentation. The product ships with four massive hard-



Using DataFlex's report generator, you can specify fields and formatting.

cover books comprising over 1,500 pages of documentation. Much of this is geared towards the DataFlex language, and the tools side of the documentation comes up somewhat short.

The on-line help system provides plenty of information concerning program use and also lets you jump to related topics in the help file. You can also create a hypercard-like help system for any applications that you create.

DataFlex offers some real strengths, including its easy-to-use tools and cross-platform possibilities. Its performance is adequate, and its application code generators can help you exploit the language without having to undertake extensive hand coding. Its downsides include limited import and export features, lack of data-integrity support, and a marked lack of connectivity. But if you can work within these confines, DataFlex offers a solid system for developing in DOS.

Borland International

• dBASE IV

BY ARTHUR PERLEY

dBASE commands respect, at the very least because its huge user base has made it an industry standard. The current release, dBASE IV, Version 2.0, which has been around for more than a year, offers some enhancements over previous incarnations. Its desktop interface and application-design tools still lag far behind the state of the art, however, and its engine-level support for data-integrity features is virtually nonexistent. As we go to press, dBASE 5.0 for DOS is waiting in the wings and promises to bring long-overdue improvements to this staid yet important product.

INCREMENTAL IMPROVEMENTS

The principal enhancements to dBASE IV, Version 2.0, target two areas: performance and language. New index and filter optimization and a Virtual Memory Manager that lets dBASE IV access 5MB or more of extended or virtual memory are primarily responsible for some performance improve-

ments since the last time we looked at the product (for more information, see "Nine Multiuser Databases: Robust and Ready

▶ FACT FILE

dBASE IV, Version 2.0



List price: \$795 **Requires:** 286-based PC or better, 1MB RAM, 3.5MB hard disk space, DOS 3.3 or later. **In short:** Despite enhancements over previous versions, dBASE IV still lags behind the state of the art. An outdated interface and a lack of database-level

data-integrity support remain frustrations for loyal users of the product. Performance has improved in some selected areas, but multiuser test scores are low to midrange. A totally revamped dBASE 5.0 for DOS, which will include some of the best features of the upcoming dBASE for Windows, is slated for summer release and could lift dBASE for DOS back to the top.

Borland International Inc., 100 Borland Way, Scotts Valley, CA 95066-3249; 800-682-9299; 408-431-1000, fax, 408-431-4123

533 on reader service card

SUITABILITY TO TASK

	dBASE IV	
	Power	Ease of Use
End user	GOOD	FAIR
Professional application development	GOOD	FAIR
Querying and reporting	FAIR	FAIR
Connectivity	GOOD	GOOD

to Share," March 31, 1992). These improvements were particularly noticeable on our Load and Index test and Report Generation test. The current release's Random Read and Random Write scores are middle to low compared with the current competition, however.

The dBASE programming language is still an important database standard, so any improvements are welcome. Many of the enhancements introduced in this version are targeted at the controls applications can use to initiate events such as updating tables or running reports. New menu commands like ON BAR, ON MENU, ON POPUP, and ON SELECTION allow developers to launch procedures when a user selects a menu item. The menu commands can be activated by a keystroke or a mouse click, and new mouse commands such as ON MOUSE can execute commands by mouse click alone.

The current release also adds support for SQL, the standard language of enterprise and client/server databases. SQL comprises a small number of powerful, high-level commands that let you modify, query, and report data; a single SQL command can often replace many lines of dBASE code.

The product's SQL Mode is accessed by issuing a SET SQL ON command, which brings you to the SQL prompt. From there, you can issue SQL commands interactively. You can also embed SQL commands within dBASE code in applications.

Another important new feature in the current version is the increase in the allowable size for arrays. You can now declare an array with as many elements as your system's virtual memory can support—as long as any one dimension does not have more than 65,535 elements. Previous versions of dBASE allowed only a total of 1,170 array elements.

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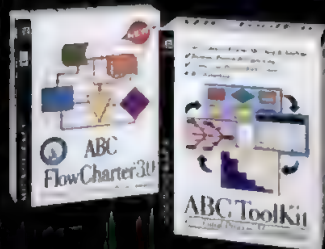
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Dec 21,
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ANNOYING LIMITATIONS

dBASE's Control Center menu is the product's basic navigation system. From there, you can build database files, run applications, and create menus, queries, reports, and screens. This menu layer provides access to the Catalog, which lists the objects already created for the system and offers a Create option. From there, you can



Not too much is new in dBASE IV's interface, but changes are just around the corner.

create and name the parts of the application being built; names are added to the list under the appropriate subject. The catalog is saved under a user-defined name and will contain the list of associated objects.

The Control Center's Tools option lets you create macros, import and export data, and change the appearance of screens, including their colors and borders.

Creating a database file in the Control Center is a good way to begin building a dBASE IV application, since the Control Center lets you use the other available tools to the fullest advantage. All of the Control Center tools can create default objects based on the database in use.

dBASE suffers from some limitations, however. Data-validation rules must be added after screens are designed and are not supported at the database level. The system has no data dictionary and supports virtually no data-integrity features. The screen generator provides no event-control devices such as push buttons or check boxes. dBASE has no menu generator, so all menu items must be coded by hand.

The report generator has an adequate interface and allows you to see the report structure on-screen. But fonts cannot be mixed, and many functions included in the language are not available in reports.

CONCURRENCY AND SECURITY

Concurrency controls are provided in the current dBASE IV through automatic record and file locking during data append and update operations. Transaction processing is provided by the combination of BEGIN TRANSACTION, END TRANSACTION, and ROLLBACK commands. Between each BEGIN TRANSACTION and END TRANSACTION, a log is created of database changes, which you can then undo using the ROLLBACK command if necessary. These controls are used exactly the same way in both dBASE procedural language and SQL Mode.

dBASE still provides a high level of security compared with other PC-based packages. With the PROTECT command, the administrator can assign system log-ons, file-level and field-level access, and automatic data encryption. In SQL Mode, the administrator can use standard SQL GRANT and REVOKE commands to assign access to tables in the database.

ALMOST HERE: DBASE 5.0

During testing, we also looked at a late beta of Borland's dBASE 5.0 for DOS (this release should be available by the time this issue appears). This new dBASE promises major enhancements, including the same two-way visual design tools that will be featured in the upcoming dBASE for Windows. Two-way tools tie together screen painters and dBASE source code through a code generator. Any changes made in one are interactively reflected back to the other.

dBASE 5.0 for DOS will focus on event-based processing and will also sport a totally new integrated development environment. Gone is the dot prompt, replaced by a resizable command window. You will be able to attach events like APPEND and REPORT directly to buttons and other controls. The IDE will also let you directly access the dBASE system, compiler, linker, and make utility; all of these will be included in one package. A new Project Manager will replace the current Catalog, and the built-in text editor appears much

improved. Context-sensitive help can be accessed anywhere in the system with a right mouse click.

Borland promises that the new version will maintain full compatibility with existing dBASE III+ and dBASE IV data, source code, and applications. It will not be fully code-compatible with the new dBASE for Windows, but Borland intends to introduce at a later date a Component Builder that will automate conversions.

Compared with other database applications-development software, the current release of dBASE IV comes up short on performance and features. The upcoming release holds promise of making dBASE IV the DOS standard it used to be.

Microsoft Corp.

EDITORS' CHOICE
Microsoft Access

BY STEPHEN W. PLAIN

Microsoft Access, Version 2.0, delivers what sounds like an impossibility: a no-compromise developer's database that's easy enough for end users to master. The current release marks a significant improvement over previous versions and adds impressive enhancements to the user interface and relational underpinnings. While the most obvious changes address end-user concerns, developers will also find the product significantly richer and

SUITABILITY TO TASK

	Microsoft Access	
	Power	Ease of Use
End user	EXCELLENT	EXCELLENT
Professional application development	EXCELLENT	EXCELLENT
Querying and reporting	EXCELLENT	EXCELLENT
Connectivity	GOOD	EXCELLENT

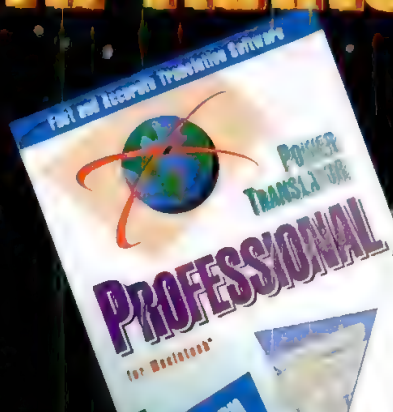
more powerful. Access scored in the midrange on all of our benchmark tests, but no better-performing product in this roundup can match its strong engine-level data-integrity features.

ENGINE MECHANICS

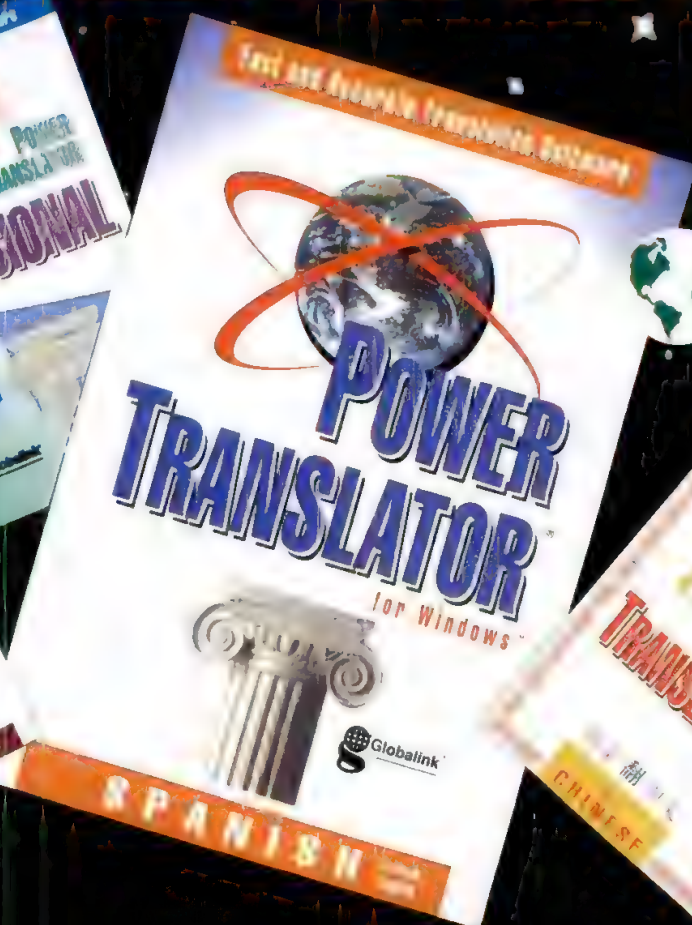
At the heart of Access is Microsoft's Jet database engine, a set of DLLs that provide sophisticated storage, integrity, query processing, and security support, as well as connectivity to a broad range of

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SUMMARY OF FEATURES

Developer Databases



Products listed in alphabetical order

■ = YES □ = NO

	Clarion Database Developer, Version 3.0	DataEase for DOS, Version 4.53	DataFlex 3.05 DOS	dBASE IV, Version 2.0	Microsoft Access, Version 2.0	Microsoft FoxPro 2.6 for DOS, Professional Edition	Microsoft FoxPro 2.6 for Windows, Professional Edition
General Features							
List price	\$995	\$795	\$995	\$795	\$495	\$695	\$995
Operating environment	DOS	DOS	DOS	DOS	Windows	DOS	Windows
Other versions available	None	OS/2, Windows	AIX, OS/2, Unix, VMS, Windows	AIX, Unix, VMS	None	Macintosh, Windows	DOS, Macintosh
Supports expanded memory	■	■	■	■	N/A ¹	□	N/A ¹
Minimum required	None	3MB	2.5MB	2MB	N/A ¹	N/A ²	N/A ¹
Supports extended memory	■	■	■	■	N/A ¹	■	N/A ¹
Minimum required	None	1MB	2.5MB	4MB	N/A ²	None	N/A ¹
Data Manipulation Limits							
Maximum column size	64K	255 bytes	16K	254 bytes	255 bytes	256 bytes	256 bytes
Maximum row size	64K	4K	16K	4K	2K	64K	64K
Maximum number of:							
Columns per table	64,000	255	255	255	255	255	255
Indexed columns per table	255	254	240	47	32	255	255
Rows per table	Unlimited	18 million	18 million	1 billion	1 billion	1 billion	1 billion
Open tables	Unlimited	60	255	40	255	255	255
Data Types							
Fixed-length character	■	■	■	■	□	■	■
Variable-length character	□	□	□	□	■	□	□
Numeric	□	□	□	■	□	■	■
Integer	■	■	■	■	■	□	□
Fixed decimal	■	■	■	□	■	□	□
Floating-point decimal	■	■	■	■	■	□	□
Date	■	■	■	■	■	■	■
Time	■	■	□	□	■	□	□
Boolean	■	■	□	■	■	■	■
Memo	■	□	■	■	■	■	■
Maximum size	64K	N/A ²	16K	64K	64K	Unlimited	Unlimited
Virtual (calculated)	□	■	□	□	□	□	□
Binary large object (BLOB)	□	□	■	□	■	□	■
Indexing							
Index maintenance can be delayed	■	■	■	■	□	■	■
Composite column indexes	■	■	■	■	■	■	■
Automatic unique index	■	■	■	□	■	□	□
Database-Based Data Integrity							
Data dictionary	■	□	□	□	■	□	□
Primary-key support	■	□	□	□	■	□	□
Composite primary-key support	■	□	□	□	■	□	□
Unique-value enforcement (any column)	■	■	■	□	■	□	□
Required fields (any column)	■	■	□	□	■	□	□
Declarative referential integrity:							
Restrict	□	□	□	□	■	□	□
Cascade update	□	□	□	□	■	□	□
Cascade delete	□	□	□	□	■	□	□
Data validation:							
Data-type enforcement	■	■	■	■	■	■	■
Pattern match	■	■	■	□	■	□	□
Data range checking	■	■	■	□	■	□	□
Table lookups	■	■	■	□	□	□	□
User-defined	■	■	■	□	■	□	□
Query Facilities							
Query language:							
Xbase-compatible	□	□	□	■	□	■	■
Proprietary	■	■	■	□	□	□	□
Query interface:							
Command line	□	■	□	■	■	■	■
Query by form/by example	□ □	■ □	■ □	□ ■	□ ■	□ ■	□ ■

N/A¹—Not applicable. This feature is supported under Microsoft Windows.N/A²—Not applicable. The product does not have this feature.

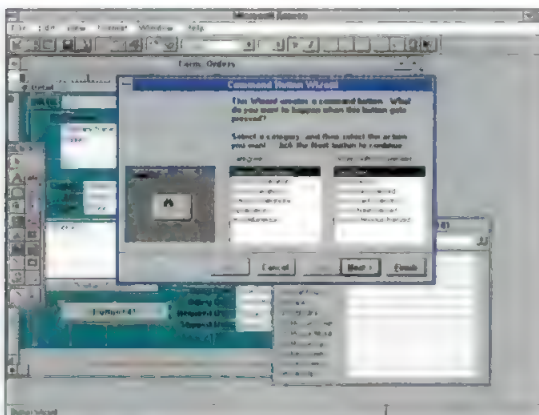
CONTINUES

Paradox for DOS, Version 4.5	Paradox for Windows, Workgroup Edition, Version 4.5	dBASE 4.5 Plus
\$795	\$495	\$795
DOS	Windows	DOS
Windows	DOS	OS/2
1MB	N/A	2.5MB
1MB	N/A	2.5MB
255 bytes	255 bytes	4K
4K	4K	4K
255	255	400
255	255	400
256MB	1 billion	Unlimited
60	Unlimited	16,000

data formats. Microsoft Visual Basic (VB) also ships with a version of Jet, but Access 2.0 features a substantially improved generation of the engine that includes some of the Rushmore query-optimizer technology used in Microsoft's FoxPro products.

The Jet engine also greatly improves Access's data-validation and integrity features. As with VB, you use properties extensively in Access to customize the behavior of every element of the database—from radio buttons to tables. A key property in Access is the Validation Rule Property that can be used to enforce validity checks on your data. Validation rules have also been improved to provide a more consistent implementation of declarative integrity. Now a validation rule that is assigned to a field or a table will be enforced whenever that data is changed, not just during data entry with a form. You can set the Validation Rule Property for each field, as well as at the record level. This gives you control over individual field values as well as the relationship between multiple fields within a given record.

The other major advance in integrity support is in the area of referential



Not just for end users, Access's Control Wizard speeds the creation of interface controls.

integrity. Access now provides unlimited levels of cascading updates and deletes, giving you tremendous control over your application's behavior without coding. Access now supports direct enforcement of a primary key as well.

Access databases are stored as standalone files with .MDB extensions that comprise all of the tables, queries, forms, reports, macros, and code modules that

FACT FILE

Microsoft Access, Version 2.0



List price: \$495 Requires:

386SX-based PC or better, 6MB RAM, 19MB hard disk space, DOS 3.1 or later, Microsoft Windows 3.1 or later **In short:** A robust visual design tool for programmers and end users alike, Access significantly beefs up its data-integrity

features and adds time-saving Wizards. Databases and applications are customizable on every level, and the product provides sophisticated storage, good security support, and connectivity to many standard local and server data formats. If you're looking for a superb Windows development tool, look no further.

Microsoft Corp., One Microsoft Way, Redmond, WA 98052, 800-426-9400, 206-882-8080; fax, 206-936-7329

525 (in reader service card)

make up an Access application. In addition to its native data format, Access can communicate with Btrieve, dBASE III+ and IV, FoxPro 2.0 and 2.5, Paradox 3.x and 4.x, and all ODBC-compatible databases, either by directly importing data or by "attaching" to them and manipulating them in their native formats. Attaching Access tables to external data is a smooth way of migrating between data formats and actually provides better performance with ODBC sources than opening those databases directly. Since you can directly manipulate Access databases with SQL and send pass-through SQL queries to ODBC-compliant SQL databases such as Microsoft SQL Server and Oracle, Access can also serve as a scalable client/server development tool.

FLEXIBLE CONSTRUCTION

Building an application in Access involves manipulating visual design tools, properties,

expressions, macros, and Access Basic code. Many tasks in the development process can be accomplished in more than one way, and this flexible approach to development makes the product useful for a wide spectrum of users.

Access is an event-driven system that lets you define actions that take place in response to various object events by assigning them macros, expressions, event

► SUMMARY OF FEATURES

Products listed in alphabetical order

■ = YES □ = NO

PC MAGAZINE
EDITORS' CHOICE

	Clarion Database Developer, Version 3.0	DataEase for DOS, Version 4.53	DataFlex 3.05 DOS	dBASE IV, Version 2.0	Microsoft Access, Version 2.0	Microsoft FoxPro 2.6 for DOS, Professional Edition	Microsoft FoxPro 2.6 for Windows, Professional Edition
Query Facilities (continued)							
Includes precompiler and optimizer	□	□	■	□	■	■	■
Recursive queries	□	□	■	□	■	□	□
Maximum number of search fields	64,000	255	Unlimited	Unlimited	255	Unlimited	Unlimited
Sorting:							
User can sort on any field	■	■	□	■	■	■	■
User can sort on multiple fields	■	■	■	■	■	■	■
Stored queries	□	■	■	■	■	■	■
Security Features							
Application encryption	■	■	■	■	■	■	■
Data encryption	■	■	□	■	■	□	□
Password protection	■	■	■	■	■	□	□
Restricted access levels							
Database	■	■	■	■	■	□	□
Dictionary	■	N/A ²	N/A ²	N/A ²	□	N/A ²	N/A ²
Table	■	■	■	■	■	□	□
User	□	■	■	■	■	□	□
Multiuser Support							
Lock types:							
Exclusive	■	■	■	■	■	■	■
Shared	■	■	■	■	■	■	■
Lock granularity:							
Database lock	□	■	□	□	■	□	□
File lock	■	■	■	■	■	■	■
Record lock	□	■	■	■	□	■	■
Field lock	□	□	■	□	□	□	□
Identifies station with lock	□	■	■	■	□	□	□
Update refresh	□	■	□	■	■	■	■
Timeout and retry control	■	□	■	■	■	■	■
Transaction processing:							
Transaction definition	■	□	■	■	■	□	□
Commit and rollback	■	□	■	□	■	□	□
Implicit locking	■	■	■	□	■	□	□
Networks supported:							
LAN Manager	■	■	■	■	■	■	■
NetWare	■	■	■	■	■	■	■
Unix	□	□	■	■	■	□	□
Import and Export							
Comma-delimited ASCII	■	■	■	■	■	■	■
Fixed-length ASCII	■	■	□	■	■	□	■
.DBF	■	■	□	■	■	■	■
.WK*	□	■	□	■	■	■	■
.XLS	□	□	□	□	■	■	■
SQL Data Access							
ODBC-compliant databases	□	□	□	□	■	□	■
SQL databases supported natively	□	□	□	■	■	■	□
SQL queries on local data	□	□	□	■	■	■	■
Application Development Tools							
Menu generator	■	■	■	■	■	■	■
Report generator	■	■	■	■	■	■	■
Application generator	■	■	■	■	□	■	■
Runtime version	□	■	■	□	■	■	■
Standalone .EXE generation	■	□	□	□	□	■	■
Technical Support							
On-line help	■	■	■	■	■	■	■
Tutorial	■	■	□	■	■	■	■
Cost of toll-call support	1 month free; then \$399 for 10 calls	6 months free; then \$99-\$695 per year	3 months free; then \$150 per year	Setup support free; then \$129-\$249 per year	Free	3 months free; then \$1,495 per year	3 months free; then \$750 for 10 calls

N/A¹—Not applicable. This feature is supported under Microsoft Windows.N/A²—Not applicable. The product does not have this feature.

ENDS

Paradox for DOS, Version 4.5	Paradox for Windows, Workgroup Edition, Version 4.5	R:BASE 4.5 Plus
		
150	266	Unlimited
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		
		

procedures, or Access Basic functions. By right-clicking on an object and selecting Properties, you can browse the object's associated properties, grouped by the categories All, Data, Event, Layout, and Other. Selecting Event will give you a list of all of the events available for the selected object. To establish a response, you can use the Macro Builder, the Expression Builder (a point-and-click dialog that helps you build complex expressions) or the Code Builder. The Code Builder lets you create an event procedure that is stored along with the form.

The Access Basic language and the event model have both been improved in this release to provide more control. The language now provides functions for OLE 2.0 Automation, giving you control over exposed objects from other OLE 2.0-compliant applications. Also new to Access Basic are the Data Access Objects (DAO) that give you complete control over data definition at runtime. This means you can dynamically create database objects such as queries and tables from within your application, and even restructure a database or create indexes in response to profiled user behavior. Additional events have been added to give finer control over runtime errors and keyboard, mouse, and timer actions.

Access is replete with over 20 Wizards that not only serve to make the product intuitive for end users, but provide productivity enhancements for developers as well. Wizards are tools that walk you through the process of creating visual and structural objects step by step, often giving you several predefined styles from which to choose. By using Control Wizards when designing forms, you can step through the process of placing a control such as a combo box on a form, define the way the control is bound to table data, and establish its layout properties—all in a matter of seconds.

SECURITY AND DISTRIBUTION

Access provides a comprehensive approach to securing your applications. Individual users and passwords can be defined, and groups of users can be created. Various permissions can then be assigned at the user or group level to tables, queries, forms, reports, macros, or new objects individually. The dialogs used

to set up the security are straightforward. The entire .MDB file can also be encrypted to prevent external access, but doing so slows down performance.

For distributing applications, the company offers the \$495 Access Developer's Toolkit (ADT). The ADT provides royalty-free runtime versions of Access, Microsoft Graph 5.0, a help compiler for creating on-line help for your application, a Setup Wizard that lets you create compressed distribution disks, and documentation on advanced topics such as creating custom Wizards. Wizards are essentially renamed .MDB files, but the standard Wizards shipped with Access cannot be distributed with your applications, according to the ADT licensing agreement.

Other products may offer individual strengths, especially speed, that Access can't match. But none of the databases in this roundup offer Access's blend of productive development tools, connectivity, and engine-level data integrity. By covering developer and end-user needs so successfully, Access even challenges the basic notion of specialized developer's database products. If you are a serious Windows developer, Version 2.0 of Access should have a place in your arsenal.

Microsoft Corp.

- **Microsoft FoxPro for DOS, Professional Edition**

BY STEPHEN W. PLAIN

Microsoft FoxPro proved long ago to be a better dBASE than dBASE. It put a windowed, event-driven face on Xbase applications, provided superior design tools and, of course, ate performance benchmark tests for lunch. Microsoft FoxPro 2.6 for DOS, Professional Edition, continues the tradition and adds a number of attractive features designed to lure even more converts from the dBASE camp. As in previous releases, the product ships with both a standard 16-bit version and an extended 32-bit version in the box. The Professional Edition also provides a compiler, SQL Connectivity Kit, and the C Library Construction Kit. FoxPro for DOS source code can be deployed in FoxPro for Windows, making the product attractive for mixed environments.

As the incremental version number indicates, there are no earth-shattering

SUITABILITY TO TASK

Microsoft FoxPro for DOS

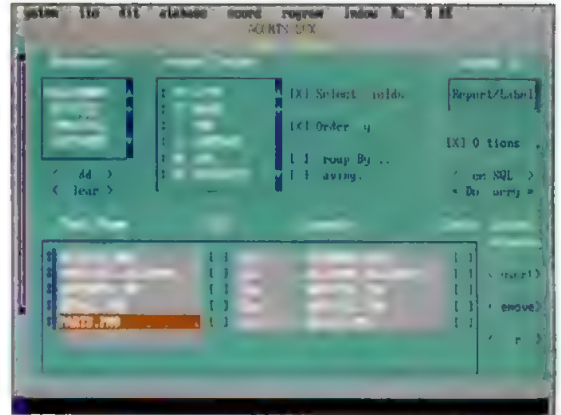
	Power	Ease of Use
End user	GOOD	FAIR
Professional application development	GOOD	FAIR
Querying and reporting	GOOD	GOOD
Connectivity	GOOD	FAIR

changes in this release. Performance is essentially unchanged—and still blazing—but new features including Wizards and the Catalog Manager have been added to make the product easier to use and to offer a smoother transition for dBASE users. Many language enhancements have also been added, primarily to address issues of compatibility with dBASE IV. The FoxPro Wizards are successful DOS versions of the company's Windows-based design aids that give even first-time users the ability to get applications off the ground quickly. Wizards are provided for creating tables, queries, screens, reports, labels, and mail-merges.

SECRET WEAPON

FoxPro, like all Xbase products, stores each table in a separate .DBF file, a time-tested format that uses fixed-length records to store data as ASCII characters. While this is perhaps the most unsophisticated of data-storage techniques, it has its advantages—mainly speed and compatibility. Indexes are usually stored in a compound index file (.CDX) that can maintain several different index tags, but individual .IDX files are still available for compatibility with FoxBASE+ data. While this data structure and language are similar to dBASE's, FoxPro has a secret weapon called Rushmore, Microsoft's proprietary optimization technology that can dramatically improve query performance in certain cases. For example, Rushmore is used automatically to optimize multitable SQL SELECT statements where appropriate.

One of FoxPro's most attractive features is its implementation of SQL, which



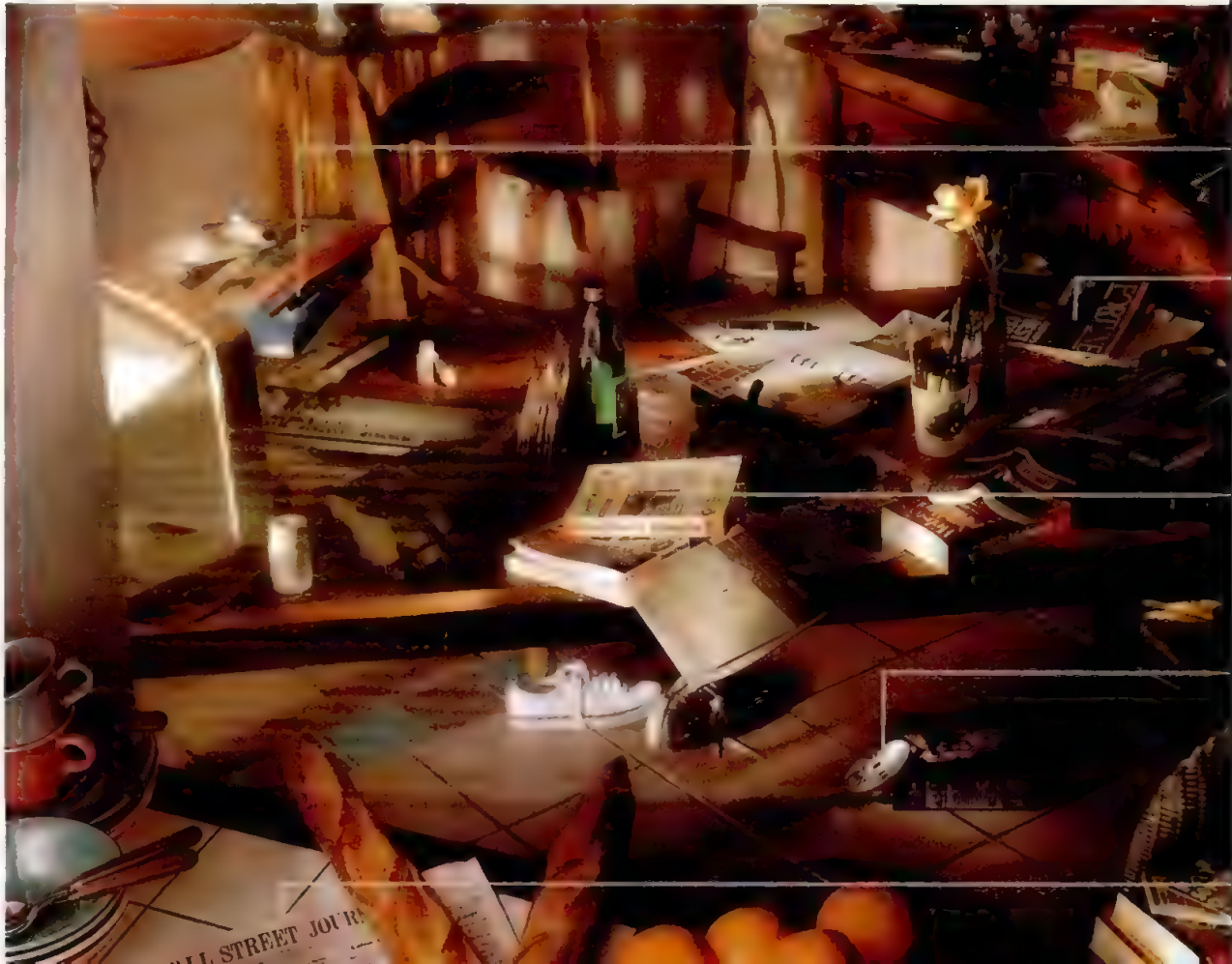
Through the Relational Query By Example window in FoxPro for DOS, you can easily define complex queries.

can be used anywhere in your source code and which generally offers the most optimized approach to retrieving data. By using a SQL SELECT statement, you can frequently accomplish in a single command what would ordinarily take many lines of Xbase code.

What Xbase systems such as FoxPro lack is the sophisticated data-integrity support of products such as Microsoft Access,



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Paradox for Windows, and R:BASE. Since each .DBF file is a separate entity, there is no central definition for relationships between tables. Consequently, rules such as cascading updates and deletes must be coded into your application. The

danger always remains that they can be bypassed interactively.

New to Version 2.6 is the Catalog Manager, a module similar to dBASE's Control Center that smoothes the process of converting dBASE applications over to FoxPro by providing compatibility with existing dBASE catalog files. Using the Catalog Manager, you can open a dBASE catalog file and access its components. The Catalog Manager keeps track of the tables, queries, screens, reports, labels, and programs and maintains a separate list for the dBASE and FoxPro versions for each category. The new AutoMigrate feature converts each element automatically when you modify it.

If you are using the Catalog Manager to manage files created initially with FoxPro's Wizards, you are given the choice of using the Wizard or the standard FoxPro editing tools to modify it. While the Catalog Manager works well with dBASE catalogs, there is no way to convert a FoxPro catalog (.FPC) directly to a FoxPro project file.

WIZARDS AND POWER TOOLS

FoxPro for DOS now offers two Wizards for building queries: The SQL Query Wizard creates a read-only query that is handy for reports while the more powerful Updatable Query Wizard generates all of the Xbase code necessary to build an editable multitable browse. Doing this the old-fashioned way takes a lot of coding so the Updatable Query Wizard can be a real time saver.

The product's Screen Wizard does a good job of creating a basic input screen, complete with navigation buttons at the bottom. Unfortunately, these screens can only pull data from a single table and the same restriction applies to the Report Wizards. Wizards have proven themselves very useful in creating common but complex elements of an application; enhanced Wizards for screens and reports would be a welcome addition.

When constructing a FoxPro application, you use the Project Manager (one of FoxPro's Power Tools) to manage your various source and data files in a .PJX project file. The Project Manager tracks

FACT FILE

Microsoft FoxPro 2.6 for DOS, Professional Edition



List price: \$695 **Requires:** 286-based PC or better, 640K RAM, 10MB hard disk space, DOS 3.1 or later **In short:** FoxPro for DOS still maintains a primary position in Xbase development for DOS while adding ease-of-use and compatibility features. Highlights of the

latest release include Wizards, a Catalog Manager, and language enhancements for dBASE compatibility. FoxPro scored consistently among the leaders on all of our benchmark tests. Although it lacks advanced relational features, FoxPro's combination of blazing speed and cross-platform source compatibility is still untouched.

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individual elements such as programs, screen sets, menus, reports, and database files and lets you compile your application to an executable file.

Aside from the Project Manager, the standard FoxPro Power Tools comprise the Screen Builder, Menu Builder, Report Writer, Relational Query By Example (RQBE) Window, and Label Designer. These tools are among the best you will find in a DOS product and, once mastered, offer a snappy interface for creating your application building blocks. The most innovative are the Screen Builder and the RQBE.

The Screen Builder is a complex module that lets you create an event-driven, windowed interface for your application. Those accustomed to event schemes in other products may find FoxPro's events somewhat foreign, however. FoxPro uses a vastly extended version of the READ command to serve as the heart of event-driven forms. Screens and their contained objects use various Read clauses to control behavior and respond to events. Mastering the Screen Builder's approach to events is crucial for successful development.

The RQBE is a mouse-driven dialog that helps you construct complete SQL SELECT queries and display them to a browse window, a cursor, or a report. The RQBE Window builds a syntactically correct SQL statement that you can view in a read-only window. This powerful tool gives you a quick way to build complex queries and learn SQL to boot.

FoxPro can directly access only .DBF files with its USE command. However, the IMPORT and APPEND FROM commands can be used to import data from a variety of formats including Lotus 1-2-3, Excel, and Paradox 3.5 and 4.0 tables. With the provided SQL Connectivity Kit, you can also access data stored in Microsoft and Sybase SQL Server databases.

One disappointment with the current release is its documentation, which hasn't been updated since Release 2.5. The documentation on Wizards and the Catalog Manager are located in the on-line help. Still, while it hasn't changed dramatically over the past year, FoxPro for DOS still holds the lead in Xbase development with its unmatched combination of speed and cross-platform source compatibility.

Microsoft Corp.

● Microsoft FoxPro for Windows, Professional Edition

BY SAL RICCIARDI

Microsoft FoxPro 2.6 for Windows, Professional Edition, combines a productive development environment with strong performance and a high level of compatibility with the dBASE IV language and the .DBF file format. The product is a sound choice for Xbase developers making the move to Microsoft Windows and for those with cross-platform projects, since highly compatible versions for DOS and the Macintosh are available now, and a Unix version is in the works. But as a DBMS, FoxPro for Windows is falling behind the times, especially when compared feature by feature with its sibling, Microsoft Access, Version 2.0.

DATA INTEGRITY, DATA TYPES

FoxPro for Windows, like most Xbase packages, supports only application-based procedural integrity. This means you must write code to enforce the data-integrity rules. For example, FoxPro for Windows does not support a built-in primary-key type, so you must implement your own by writing code to prevent duplicate values from being entered into the primary-key column (primary-key integrity rule) and to prevent a row with missing primary-key value from being entered (entity integrity rule). Support for maintaining column integrity and referential integrity must also be custom programmed.

FoxPro for Windows supports the traditional .DBF file-format data types: character, date, logical, numeric (stored as numeric ASCII), unlimited-length memo field, and a general data type used to store OLE data (FoxPro for Windows can be an OLE 1.0 container but not a server). Missing are a dedicated currency data type and an automatic incremental counter field.

FoxPro for Windows' compound index files (.CDXs) combine many individual indexes into a single file that is automatically opened with its associated database. These indexes are automatically updated to reflect changes to the database. FoxPro for Windows compresses .CDX files so

SUITABILITY TO TASK

	Microsoft FoxPro for Windows	
	Power	Ease of Use
End user	FAIR	FAIR
Professional application development	GOOD	FAIR
Querying and reporting	GOOD	GOOD
Connectivity	GOOD	FAIR

that they take up much less space on-disk. And because the index is physically smaller, more of it can be kept resident in RAM, where it can be accessed faster and better utilized by FoxPro for Windows' Rushmore data-access technique. Rushmore optimization, introduced in Version 2.0, takes advantage of available indexes to speed up data access for certain optimizable queries.

LANGUAGE AND QUERY FACILITIES

FoxPro for Windows' extensive Xbase programming language is largely a superset of dBASE IV's programming language. Missing, however, is transaction support such as dBASE IV's BEGIN TRANSACTION, END TRANSACTION, and ROLLBACK commands. FoxPro for Windows' READ command lets you create event-driven programs such as those demonstrated by the sample applications shipped with the product. You can, for example, have several data entry windows active at the same time and mouse click between them. However, the technique required to do this, Foundation Read, is cumbersome. FoxPro for Windows ships with an add-on library called FOXTOOLS.FLL, which lets you register and call Windows DLL functions.

The query builder, called the Relational Query By Example (RQBE), lets you construct a query by entering information using dialog boxes and menus. FoxPro for Windows then generates code that includes a SQL SELECT statement to perform the query. SELECT is useful because it does what would otherwise require several Xbase commands and because it's nonprocedural, which lets FoxPro for Windows decide the fastest way to get the result. RQBE is useful for learning SELECT because you can stop at any point and see what the associated SELECT would look like. Changes to the SQL statement are not automatically



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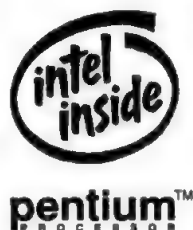
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The AMBRA DP60PCI System, InfoWorld, March 14, 1994



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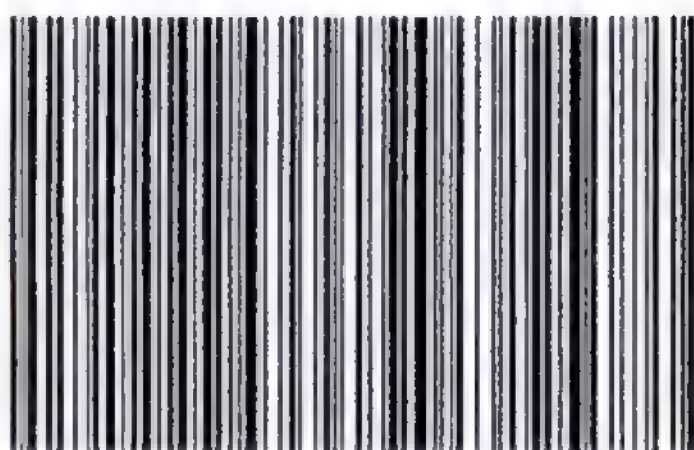
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Inverted Back

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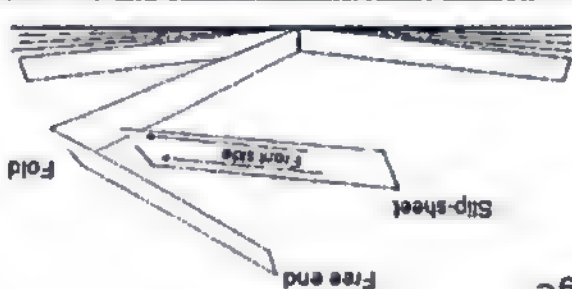
Folded edge of the page



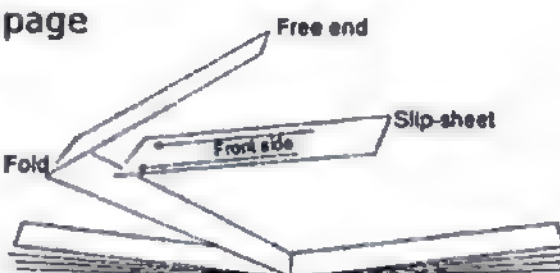
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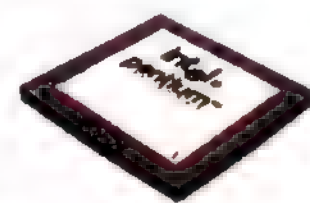
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N75D-340
PC World,
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The Ambra
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InfoWorld,
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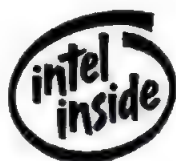
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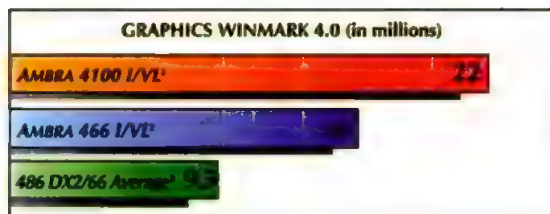


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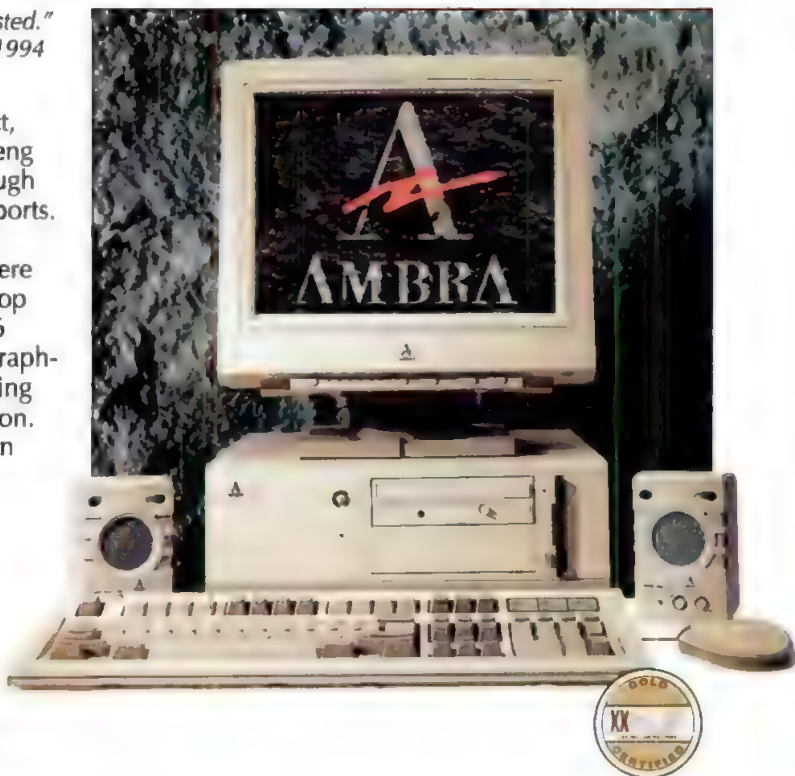
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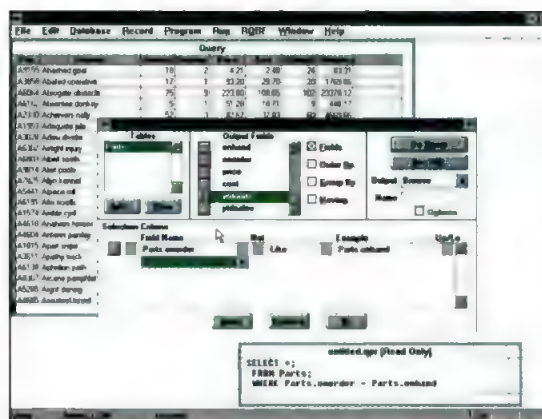


reflected back in the RQBE window, however. Missing from RQBE is a graphical join feature like that found in some other products. FoxPro for Windows' query result is effectively read-only: If you update the result, your changes are not propagated back to the original tables.

INTERFACE AND DEVELOPMENT TOOLS

The Screen Builder lets you use the mouse to design data entry forms, dialog boxes, windows, and so on that make use of FoxPro for Windows' user-interface controls. You can then enter code snippets directly into your screen designs. To design pull-down menus, you can use the dedicated Menu Builder, which—like the Screen Builder—stores its information in a special database. Here, too, you can attach code to objects in the Menu Builder that will be included in your final application. Your screen and menu designs are then processed through a code generator that generates FoxPro for Windows code to do the real work.

FoxPro for Windows' report writer is object oriented and makes it easy to experiment and move things around on the design surface. You can include fields from multiple tables and use a preview mode to view the report. The Project Manager (PM) lets you group together all of the files, programs, reports, screens, and so on needed to create an application.



FoxPro for Windows' Relational Query By Example Window gives instant SQL feedback.

The Professional Edition also includes a number of developer add-on kits. The FoxPro Distribution Kit can be used with the PM to create runtime applications for distribution. Runtime applications include your application's .EXE file and the FoxPro Support Library file along with any associated help file or add-on library files.

The Client-Server Connectivity Kit lets you create client/server applications that use ODBC to connect to server databases or other ODBC data sources. The Workgroup Extensions Kit lets you integrate Microsoft Mail into your FoxPro for Windows applications. Finally, the Library Construction Kit provides an external API that gives you access to much of FoxPro for Windows' internals. Using C and the Library Construction Kit, you can create add-on libraries of routines that can be accessed from FoxPro for Windows.

MULTIUSER ISSUES

For multiuser development, FoxPro for Windows supports concurrent use through traditional file and record locking. You can explicitly lock records and files using the RLOCK and FLOCK functions or trap and respond to contention conditions using implicit locking and an ON ERROR type handler.

FoxPro for Windows automatically locks files and records on an as-needed basis depending on the operation being attempted. In interactive use, FoxPro for Windows locks a record as soon as you begin typing into the field. When you finish making your changes and move the cursor off the record, FoxPro for Windows releases the lock. Deadlocks are prevented

by means of the SET REPROCESS command, which determines how unsuccessful lock attempts are handled.

All users will benefit from the product's useful collection of Wizards—dialog box-driven applications designed to make common tasks easier to perform. Included are a Label Wizard, a Screen Wizard, a Table Wizard, and several Query Wizards and Report Wizards. With each, you answer just a few questions, and the Wizard uses your responses to perform a task. Also included is a Catalog Manager, which will

be familiar to users of dBASE IV's Control Center. Still, FoxPro for Windows remains difficult for end users. The on-line help and extensive documentation are oriented towards developers, too.

FoxPro for Windows' development environment, Xbase compatibility, and impressive performance make it an attractive choice for Xbase developers. But its complexity for end users and lack of database-level integrity support are weaknesses. Look for improvements in the next major release.

Borland International Inc.

Paradox for DOS

BY STEPHEN W. PLAIN

Though increasingly overshadowed by its Windows sibling, Paradox for DOS, Version 4.5, remains a lean and mean database that offers a highly functional query interface and a reasonably robust development platform, both of which are based on a well-optimized data engine. This release brings several enhancements for both developers and end users.

ON THE DESKTOP

Everything in Paradox for DOS centers around images of tables on the imaginary Paradox Desktop. While this is a visual metaphor when working with the product interactively, the same concept applies when writing Paradox for DOS scripts. The number of tables that can be active on the Desktop has been upped to 60 from 24 in the previous version, an improvement that opens the way to more complex applications.

FACT FILE

Microsoft FoxPro for Windows, Professional Edition



List price: \$695 **Requires:** 386SX-based PC or better, 4MB RAM, 10MB hard disk space, DOS 3.1 or later, Microsoft Windows 3.0 or later running in 386 Enhanced mode **In short:** Microsoft FoxPro 2.6 for Windows, Professional Edition,

has Xbase compatibility, a productive development environment, and impressive Rushmore-enhanced performance, making it an attractive professional platform. FoxPro for Windows consistently placed near the top on all our benchmark tests. But its lack of engine-level support for data integrity and its limitation to read-only queries mark it as slightly behind on the technology curve. You might be better off waiting for the next release.

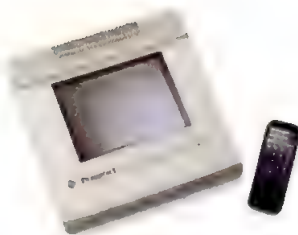
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The two main tasks performed interactively on the Desktop are browsing and querying data, accomplished using the View and Ask menu options, respectively. Normally, data is viewed in a tabular format although you can attach up to 15 custom forms to each table. Unlike many products that treat forms and reports as objects separate from tables, Paradox for DOS links these elements to a particular table as a Family. While this approach makes sense most of the time, there are situations in which you'll wish you had more control over your forms. For example, to create multitable forms, you must build a form for each table separately and embed one within the other.

In master/detail forms involving multiple tables, Paradox for DOS automatically enforces the most commonly defined rules of referential integrity—mainly that child records must be deleted before a parent record can be deleted and that updates of key values cascade to child records when the master record's key is updated. These rules are enforced only through linked forms, however, and not at the database engine level.

While the forms portion of the product could use some sprucing up, there is no complaining about the excellent QBE (query by example) interface used when you perform an Ask. Paradox for DOS was one of the first products to provide QBE, and the package still implements the tech-

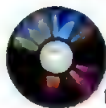
using either single-table View Images or through single or multitable forms.

When a table Image is present on the Desktop, the recommended way of editing it is by using the CoEdit mode, initiated by pressing ALT-F9. The regular Edit mode, used in earlier versions of Paradox for DOS in single-user environments, is still supported through the F9 key, however. In CoEdit mode, updates to tables

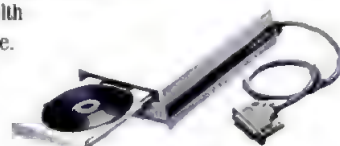
are executed live and can be performed by multiple users simultaneously. In the regular Edit mode, the tables on the Desktop are table-locked and successive updates are buffered temporarily until the F2 key is pressed to post all updates. The one advantage of Edit mode is that you can perform multiple undo commands while in the temporary buffering mode; the disadvantage, of course, is that you're



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SUITABILITY TO TASK

Paradox for DOS

	Power	Ease of Use
End user	FAIR	GOOD
Professional application development	GOOD	FAIR
Querying and reporting	GOOD	GOOD
Connectivity	GOOD	EXCELLENT

nology better than most. You add each table to the query using the Ask command and a corresponding Image is placed on the Desktop. Example elements are created using the F5 key. Then, by placing any filter criteria you desire in the field columns and pressing F2, you complete the query and produce a separate Answer table on the Desktop. While changing a query result will not update the original tables (the Answer table is a separate physical table), you can update data directly

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locking any other users out of those tables. While manually updating a single row in a 100,000-row table, we discovered a bug in the Edit mode that caused secondary indexes related to that table to be detached. Although Paradox for DOS is supposed to rebuild indexes automatically in such cases the next time they are accessed, this failed to work as well. The company is working on a solution.

Paradox for DOS differs from most PC

porated into your source code. Version 4.5 includes over 40 new PAL commands and enhancements to 26 others, giving you greater control over keystroke events, improved dialog-box objects, and the new Getrecord command that locates a record based on supplied field-value parameters without placing the table on the Desktop.

Another major enhancement in 4.5 is a replacement for the woefully inadequate

single-line source-code debugger that came with previous versions. The new debugger offers a full-screen mode that comprises three resizable sections called the Script pane, Watch pane, and MiniScript pane. The Script pane gives you a trace view of your source as it is executed and allows you to set breakpoints. The Watch pane provides a way to monitor the values of variables and expressions while the debugger proceeds. With the MiniScript pane, you can execute PAL

commands interactively before continuing to the next line of the script.

The reporting and graphing facilities in Paradox for DOS are a bit dated. Both tabular and free-form reports can be created but the banded Report Designer provides only rudimentary formatting control. While the Form Designer now has better mouse support, the Report Designer still forces you to move fields in a free-form report using the Insert and



Defining a standard master/detail form in Paradox for DOS.

databases in its use of a clustered primary index, a feature that can dramatically improve search times on key values. Once you define the key field or fields for a table, the table is physically ordered according to the key. External to the table, a .PX file contains a table that Paradox for DOS uses to access the key. The benefits of Paradox for DOS's clustered index were clearly seen on our Select test, where the product took first place. The product's only poor benchmark test result came on our random Write test; its less-than-optimal score is attributable to its proprietary locking scheme.

IMPROVED LANGUAGE AND DEBUGGING

Paradox for DOS's strong scripting language, PAL, lets you work with data much as you would interactively through the program's menu commands. For instance, you still use the View command in code to place a table Image on the Desktop and the CoEdit command to go into editing mode. Because of the synergy between PAL and the interactive Paradox for DOS environment, you can also use the keystroke recorder to save operations quickly for use in scripts. QBE specifications can also be saved and incor-

► FACT FILE

Paradox for DOS, Version 4.5

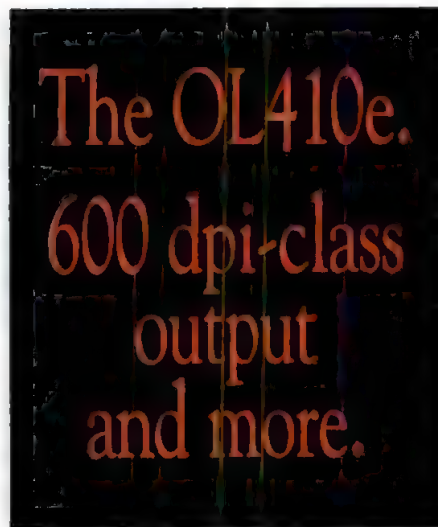


List price: \$795 **Requires:** 286-based PC or better, 1MB RAM, 7MB hard disk space, DOS 3.1 or later **In short:** While it doesn't have the prettiest face, Paradox for DOS does offer strong query tools and fairly robust development features. Reporting and

graphing are a bit dated but are up to standard business tasks. Paradox performed well in testing, and its clustered index provides fast searches on key values. The Windows version of the product is ahead on several fronts, but this DOS release has much to recommend it.

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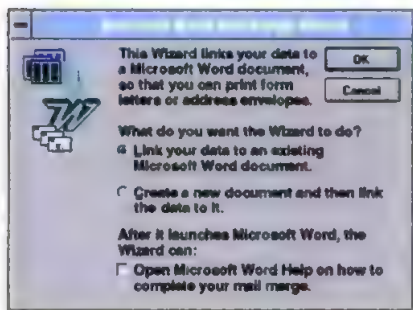
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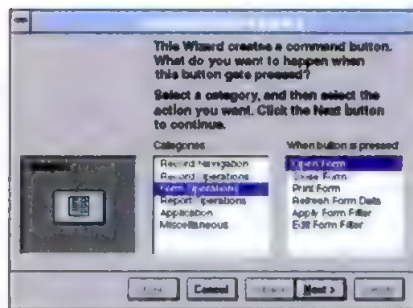
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Microsoft Office

Delete keys or by simply erasing the fields and placing them in different locations. The product's graphing engine offers several different graph types including pie charts, area charts, scatter graphs, and 3-D column graphs, but the graphing module is not integrated with either the forms or reports module. While this makes building visually sophisticated applications unnecessarily difficult, typical business requirements are covered.

Paradox for DOS applications can be distributed with the \$495 runtime version of the product with no limits on the number of users or added licensing fees. A version of Borland's SQL Link is available to provide access to SQL database servers.

Borland clearly sees the future of Paradox in the Windows version of the product and has not announced plans to upgrade the DOS versions beyond 4.5. While a switch to the Windows version promises many benefits, not everyone can or wishes to leave DOS. For these users, Paradox for DOS still offers an easy-to-learn interface and considerable power.

Borland International Inc.

• Paradox for Windows, Workgroup Edition

BY STEPHEN W. PLAIN

If you're a Paradox developer and haven't made the move to Windows, it's time to reconsider. Paradox for Windows, Workgroup Edition, Version 4.5, offers sophisticated development tools that arguably leave the DOS product in the dust. It also delivers a strong platform for corporate workgroup development using the included Object Exchange (OBEX) connectivity software and Borland's SQL Link drivers. While Paradox for Windows earned midrange scores on our benchmark tests, its performance should be fully adequate in real-world scenarios where transaction loads are more balanced. Paradox 5.0 for Windows, in late beta testing at press time, promises even more features and usability.

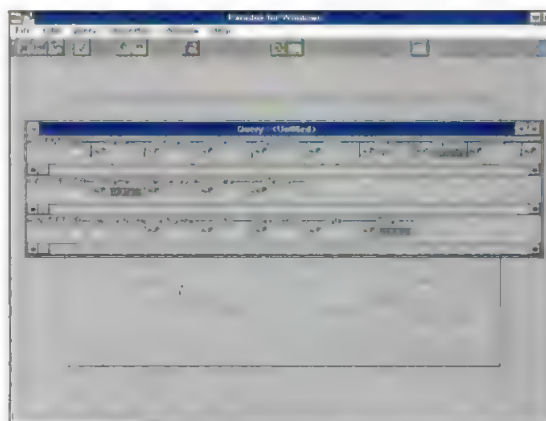
CONNECTIVITY, INTEGRITY

Paradox for Windows reads and writes both Paradox and dBASE files directly, and with the SQL Link component, can access Informix, Interbase, Microsoft and Sybase SQL Server, and Oracle 6 SQL

tables as though they were local Paradox data. Unlike most competitors, Paradox for Windows enforces referential integrity at the engine level, ensuring that the rules cannot be bypassed by any operation. You can specify that changes to a parent table's key cascade to change the corresponding field in any child records, or that changes to the parent's key be prohibited if child records exist.

The product's development environment is forms-centric and leverages Paradox's complex but flexible event model. The first step in creating an application usually involves creating the forms that will act as the user interface. To create a form, you first specify the data behind it by using the Data Model dialog, a screen that lets you visually add tables to a relationship diagram and drag links between them.

You are then presented with the Design Layout dialog that lets you customize the



Paradox for Windows improves on the DOS version's successful QBE interface.

tools through the Speedbar, Paradox for Windows' context-sensitive toolbar. From the Speedbar, you can switch between design and run modes to test your designs. As you do so, the Speedbar toggles between the design tools and record-navigation buttons. You can place buttons, shapes, bitmapped images, OLE 1.0 objects, graphs, and crosstabs, in addition to data-entry fields, directly onto forms. Forms and their objects can be customized through a series of pop-up menus accessible via the right mouse button. The Method dialog box can be popped up to add to or modify any object's methods or data. Using the Object Tree button on the Speedbar, you can bring up a graphical tree view of the form's objects and customize each object in the tree via the right

SUITABILITY TO TASK

	Paradox for Windows	
	Power	Ease of Use
End user	EXCELLENT	GOOD
Professional application development	EXCELLENT	GOOD
Querying and reporting	GOOD	EXCELLENT
Connectivity	EXCELLENT	EXCELLENT

look of the form you are about to create. While viewing a sample image in the preview section of the screen, you can select between single- and multirecord layouts and change the style of a master/detail layout. These steps take you a long way in the design process and leave you in the easy-to-use Form Designer, which serves not only as a place to paint forms but as a launch pad for object manipulation.

To create a report, you use the same Data Model and Design Layout dialogs used for building forms. The WYSIWYG Report Designer is as easy to use as the Form Designer, and offers the ability to switch between Design and Preview modes from the SpeedBar. Your report can include graphics and charts but not crosstabs.

The Form Designer is uncluttered and offers a complete set of visual painting

▶ FACT FILE

Paradox for Windows, Workgroup Edition, Version 4.5



List price: \$495 **Requires:** 386-based PC or better, 4MB RAM, 20MB hard disk space, Microsoft Windows 3.1 or later **In short:** Paradox for Windows offers a solid platform for standalone and corporate workgroup development. Strong data-integrity

enforcement, good SQL connectivity, and intuitive tools characterize this product. The ObjectPAL language and design environment are object-oriented and may mean a change in your coding habits. The next release, Paradox 5.0, looks even better and may be shipping by the time this story appears.

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mouse button. The entire Form Designer is well thought out and easy to figure out.

MOVING TO OBJECTS

While not an object-oriented programming language as such, Paradox for Windows' ObjectPAL is squarely object-based and provides some traditional OOP benefits such as encapsulation. Every element of a Paradox for Windows application—every table, query, data-entry field, and even rectangle on a form—is treated as a distinct object with its own default properties and behavior. Each object can also contain its own variables, constants, custom data types, as well as custom code that you write in the form of procedures and methods. Each object automatically responds to certain internal and external events; you customize your objects by adding code to the appropriate method for an event.

External events, caused mainly by user actions, can be routed to a number of objects in an upward progression through the levels of objects on a form. Determining which object to attach your code to in order to get the desired behavior with the minimum amount of initial programming and maintenance headaches is a very important part of the process.

Your ObjectPAL code does not need to be attached to forms, however. You can also create libraries of custom methods and procedures that can be opened and accessed from any form. To provide the interface between an object on a form and methods contained in libraries, you place prototypes of the methods in the Uses code window of the object or form. You can also prototype and make calls to any Windows DLL.

The QBE interface in Paradox for Windows uses a similar approach to that of the DOS version but the Windows environment makes it shine. Fields can be checked off with a mouse click and easily moved via drag-and-drop. Example elements are easily defined using the Join Tables icon on the Speedbar; you simply click the icon, then click the two fields you wish to link. An Answer Table Properties dialog lets you slightly customize the separate answer table that will receive the output of the query. You can rename this file, specify whether it should be a dBASE or Paradox table, and establish column widths for display.

The OBEX engine included with the Workgroup Edition links your Paradox data to various mail services such as cc:Mail, MAPI, MCI Mail, Microsoft Windows for Workgroups, and Novell MHS via a modem connection. With OBEX, each user is set up to "subscribe" to distribution lists or "publish" lists through scheduled polling sessions. The exchanged data can be a table, the result of a query, or binary files.

THE NEXT RELEASE

Waiting in the wings as we go to press is Paradox 5.0 for Windows. Although this release will add some significant ease-of-use features, the biggest improvements are on the developer's side of the fence. An example is the Project Viewer, a long-overdue centralized collection of the various Paradox objects in a single dialog. New Logical, Time, Long Integer, and Auto-incrementing field types have been added, and new connections to Informix, ODBC, and Oracle 7 databases will be available through the company's IDAPI (Independent Database API) architecture. Version 5.0 will also be OLE 2.0-compliant, both as a server and a container. The results of single-table interactive queries will now be editable; changes made to the result set will be applied to the underlying table. You will, of course, be able to update multiple tables through forms. For users of all levels, Paradox 5.0 will also include new hand-holders in the form of Interactive Tutors and three Experts that aid you in the creation of forms, reports, and labels.

Overall, the current version of Paradox for Windows is a strong choice for standalone or workgroup development, especially if you're making the move to objects. The new release should only make it stronger.

Microrim Inc.

● R:BASE Plus

BY JOE SALEMI

Microrim's R:BASE was one of the first PC-based databases around and the first to adopt a strict relational model. R:BASE 4.5 Plus continues that tradition while adding improvements such as full support for ANSI SQL, better optimization of SQL commands, enhanced forms

and browsing capabilities, and increased data-integrity enforcement.

R:BASE comes with two DOS versions in the package: a 16-bit version for 286-based systems and a 32-bit version for 386-based or better systems. Microrim also sells an OS/2 character-mode version but does not yet have a release for Microsoft Windows.

Each R:BASE database is stored as three files. The first holds the data dictionary, which contains information about the database structure, the second holds the actual data, and the third holds the indexes. Stored data is presented to the user in table format. Forms, reports, and views are also treated as data and are stored in the database file along with the user data. The database files are automatically encrypted and can only be accessed through R:BASE or a utility that works with the R:BASE data file structure. The package includes two external utilities that can check the database files for inconsistencies and correct them.

R:BASE can import and export a number of data formats, including .DBF, .WKS, and ASCII. It also includes direct support for accessing dBASE .DBF files, which can then be used as if they were native R:BASE tables. The .DBF files can be updated, used for lookups, or joined with native R:BASE tables in queries, forms, and reports.

NATIVE SQL

R:BASE's native command language is SQL with Microrim enhancements. The

▶ FACT FILE

R:BASE 4.5 Plus



List price: \$795. **Requires:** 386-based PC or better, 2 5MB RAM, 5MB hard disk space, DOS 3.1 or later. **In short:** One of the classic PC databases, R:BASE offers a strong relational architecture and uses SQL as its native query language. Data-integrity features are

among the strongest of any package we saw, and R:BASE's excellent application generator can smooth the development path. The package is not available for Windows or OS/2's Presentation Manager, but for character-mode development, its strengths make it worth evaluating.

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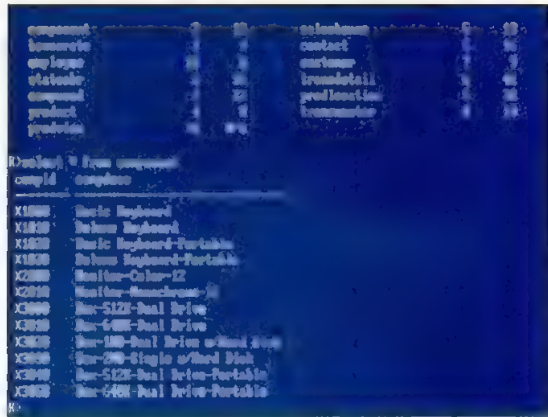
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SQL is R:BASE's native language, and you can enter SQL commands interactively at the R: prompt.

current release has added support for the ANSI-92 SQL Entry Level Standard, including support for primary and foreign keys with deletion constraints that restrict users from deleting the primary key if foreign keys depend on it. Tables can be created with a Check option that acts as a trigger to check the data before accepting an update or insert. R:BASE was one of the first PC-based databases to support rules, letting application developers provide additional data-integrity checks and enforce data ranges. The user can bypass rules by turning off rule enforcement, but the data integrity provided by primary and foreign keys always operates and can't be bypassed.

R:BASE's query speed has been enhanced through the addition of the Smarter Query Optimizer. This new SQL optimizer uses statistical and historical information from the enhanced database indexes to determine the fastest method of performing the query. Speed has also been enhanced through the use of user-definable cache memory buffers and the ability to set the database schema as read-only in multiuser mode. In addition to table- and row-level locking, R:BASE now supports page-level locking, which provides you with a midrange performance level. R:BASE has consistently improved in our benchmark test rankings over the years, and it now scores respectably in the midrange on most tests.

Another new feature is full-text indexing. You can specify the number of characters of the text or note field to be indexed, and indexes can also be created on multiple columns. Database security is

provided through the standard SQL GRANT and REVOKE commands.

UI AND APPS DEVELOPMENT

R:BASE's application language and user interface are closely tied together. Extensions to its native SQL are used for creating menus, displaying data, and completing other tasks. The application-development process is smoothed by Application Express, a built-in application generator that walks you through the entire process of designing the database; creating

forms, queries, reports, and menus; and generating the final code. Application code can be stored in a plain ASCII file or can be compiled to speed execution and prevent modifications. Your code can be compiled as is or can first be customized using the supplied text editor or an external text editor. R:BASE includes a source-code debugger that supports stepping, watchpoints, and breakpoints.

The primary user interface is a com-

SUITABILITY TO TASK

	R:BASE Plus	
	Power	Ease of Use
End user	GOOD	FAIR
Professional application development	GOOD	GOOD
Querying and reporting	GOOD	GOOD
Connectivity	GOOD	EXCELLENT

mand-bar menu with pull-down menus that users access from the keyboard or with a mouse. R:BASE defaults to displaying data in a browse table. Queries can be entered in native SQL through a command box or through the QBE (query by example) interface. Full support is included for multitable views. Queries can be stored on-disk or as keyboard macros for future use. R:BASE also has extensive multitable-forms capabilities, which can be used for data entry and lookups. Forms and reports are designed through their respective Express modules, which can be called from the main menu or through Application Express.

An application can consist of any combination of forms, reports, and QBE

screens. A number of menu styles can be created, including box menus, command-bar pull-down menus, and pop-up menus. Pop-up menus can also be used for data lookups in a form. Applications can include a type of trigger called an Exit Function that calls rules or subroutines when a user exits a form. Applications can be distributed with the optional runtime version of R:BASE.

R:BASE includes full on-line context-sensitive help screens. It also supports custom help screens that can be created in Application Express and included in the final application. R:BASE also provides the older prompt-by-example and R> prompt interfaces so near and dear to long-time users. Overall, the UI makes it easy for the beginner to be productive while still offering the power developers need to create complex database applications.

MULTIUSER SUPPORT

Multiuser support is included in the base package and can be enabled by a simple command that can be included in the configuration file. The current release enhances the multiuser capabilities by allowing the database administrator to put the data file on a separate physical disk drive from the data dictionary and indexes. This clears the way for larger databases than previous releases could support.

ODBC is not currently supported but Microrim does sell the R:BASE SQL Engine for DOS and Windows, which uses an API based on ODBC and can be used to create standalone applications in C or Microsoft Visual Basic. Microrim also sells R:BASE for Vanguard versions that are code-compatible with R:BASE 4.5 Plus and provide support for accessing a number of client/server databases, including Digital's RDB/VMS, Microsoft SQL Server, Oracle, and Microrim's own VMS-based Vanguard server.

R:BASE 4.5 Plus is still a character-mode program, which some organizations may see as a drawback. But its strong relational architecture, built-in data integrity, native SQL, and excellent applications generator are impressive strengths. Existing users will definitely want to upgrade, and others should evaluate R:BASE's potential for character-based multiuser systems. □

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When Is a Fax

Answer: When it's an editable document, an e-mail message, a voice-mail message, or a text-to-speech message. Exciting new communications technologies are rapidly transforming the scope and definition of PC-based faxing.



By M. David Stone

Remember when articles on PC-based faxing always included a point/counterpoint debate over whether it made sense? You don't see those debates any more—in part, because faxing from your computer has become, if not mainstream, at least fairly common. More important, the potential of PC-based faxing has so far outstripped that of mere fax machines that it's hard to make a case against it.

Not a Fax?

Optical character recognition (OCR) and binary-file transfer (BFT) are on the verge of redefining faxes as editable documents rather than graphic images. Mail APIs, text-to-speech technology, and modems with data, fax, and voice processing are offering new possibilities. The inevitable result will be

fully integrated PC-based messaging centers, with fax capabilities, voice mail, e-mail, and data transfer all provided in a one-stop-shopping format. We'll come back to these leading-edge issues a bit later, but to put them in perspective,

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- **FaxWorks PRO 3.0 for Windows**
- **WinFax PRO, Version 4.0**

Like the fruit flies that many of us bred in our college genetics courses, fax software is a rapidly evolving species. Several strong packages have died out in the 21 months since our last roundup, new

products have sprung up to take their places, and survivors have developed in dramatic and surprising ways. As a whole, the products in this category have grown in terms of reliability, convenience, and power while diminishing in price.

Our two Editors' Choice recipients, SofNet's FaxWorks PRO 3.0 for Windows and Delrina's WinFax PRO, Version 4.0, offer users a choice between fairly clear alternatives: FaxWorks PRO represents a more direct extension of the main evolutionary line. Its selective ad-

vantage is a refined and efficient interface, fine-tuned to reduce the inconvenience of faxing. The product's highly developed screen-display technology brings speed and richness to all areas of faxing that relate to viewing and manipulating images, from initial read to information retrieval to page-by-page document assembly. In something of an evolutionary departure, FaxWorks PRO's ability to work in concert with object-oriented PIMs such as CrossTies and PackRat begins to alter faxing's identity as an activi-

ty in and of itself, making it an integrated part of a larger communication and record-keeping process.

WinFax PRO, by contrast, comes across as more youthful and muscular and is definitely starting down some important new evolutionary paths. It too is blurring the lines between faxing and other forms of communication (much more radically than FaxWorks PRO), by joining fax capability, e-mail, and binary-file transfer (BFT) under a single interface. Through the use of standard mail APIs, WinFax PRO lets users set up individual address book entries as either fax or e-mail recipients and thereafter send documents automatically, without having to specify the communications methodology.

Another of WinFax PRO's revolutionary directions is its strong emphasis on addressing the needs of mobile computer users. By adding automatic fax forwarding,

let's start with a look at the current state of fax software.

Much of the credit for current acceptance of PC-based faxing goes to Windows-based fax programs, virtually all of which install drivers that Windows treats as print drivers. There's nothing in Windows that requires this approach; it's won out because it makes computer-based faxing easy. Even the most technophobic user can fax simply by "printing" the document and entering a phone number to fax to. That makes your PC the more convenient choice by far when you're faxing something that already exists on-disk. And it justifies the effort of scanning a document into your system when you need to send the same document to everyone on a large distribution list.

IS DOS FAXING DEAD?

There's little new to be said about faxing from DOS. DOS fax programs haven't

dried up and blown away—yet—but even Windows fax programs no longer offer the level of DOS support that we saw in *PC Magazine's* last fax overview ("The Fax Solution," December 8, 1992).

Delrina Corp., for example, still sells DosFax PRO, as well as WinFax PRO, Version 4.0, which you'll find reviewed here. But DosFax PRO is still in Version 2.0—which we reviewed almost two years ago. Further, Delrina no longer designs its DOS and Windows programs to share elements such as fax logs and phone books. It doesn't even supply a DOS TSR with WinFax PRO to let you receive faxes while you're in DOS. According to the company, a survey indicated that most WinFax PRO users who run DOS programs run them from within Windows, so they don't need a TSR. Cheyenne Communications, Standalone Division, makes a DOS version of BitFax Professional

available but does not provide a DOS TSR in the unrelated Windows version, BitFax Professional for Windows, Version 3.02.

Not all vendors share this view. Thought Communications includes a DOS TSR as part of FaxTalk Plus for Windows, Version 1.50B, so you can receive faxes while in DOS. Even so, a Thought Communications representative acknowledges that DOS is "certainly not where there are a lot of exciting new features." In another example, Trio Information Systems' DataFax+, Version 4.2, comes in both a full version (with a DOS module) and a less expensive version for Windows only.

Given the rapidly waning importance of DOS-based faxing, we limited this roundup to Windows- and OS/2-based programs. We found ten of the former—including the five just mentioned—and one of the latter: Fax/PM, Version 2.2, from American TeleRep. The other five Windows products are WordPerfect Corp.'s ExpressFax+, Version 3.0; SofNet's FaxWorks PRO 3.0 for Windows; Smith Micro Software's Quick Link GOLD, Version 1.2.0; Mustang Software's QModemPro for Windows, Version 1.1; and MediaPoint's ZiPComm, Version 3.1.

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promoting the concept of a fax mailbox, and implementing optional links to pagers, Delrina has brought to the mass market an arsenal of highly useful weapons for the road warrior.

Eclipse FAX, Version 6.0, our Editors' Choice recipient last time out, remains a sturdy and well-rounded product (under new management: Phoenix Technologies), but its former fax management prowess has not quite kept pace with that of the competition. Another noteworthy product is BitFax Professional for Windows, Version 3.02, from Cheyenne Communications, Standalone Division, which combines faxing, data communications, and voice capability. DataFax+, Version 4.2, from Trio Information Systems, is another fine package, offering a full feature set and unusually flexible multilanguage support.

THE BASIC FAX

Although Windows-based fax programs can be as easy to use as a fax machine—or easier, in some cases—there are some computer-specific fax-related standards that you should know about when choosing a program. You'll want to be aware of these standards when you choose a modem as well.

Of the several standards used for com-

municating between a PC and modem, the most important are the ones developed by the Telecommunications Industry Association (TIA): Class 1, Class 2, and Class 2.0. Any fax modem you buy today should support at least one of the first two; the third will probably become important over the next year or so. If you have an older fax modem, however, and you aren't ready to upgrade your hardware, you may need either CAS (Communicating Application Specification) or SendFax support in your software. We'll cover these older standards first.

CAS was developed by Intel and Digital Communications Associates. CAS defines an application programming interface (API) for communications in general, including faxing. The idea behind CAS was to allow background communications by letting software talk to the CAS hardware via the API. Since few vendors ever jumped on the CAS bandwagon, CAS support is irrelevant for most users today; even Intel's modems support Class 1 or Class 2 standards. And unless you already have an Intel SatisFAXtion board or other CAS hardware in your system, you don't need to worry about CAS support in your fax software.

SendFax, developed by Sierra Semiconductor, can send faxes but can't receive them. This standard enjoyed a brief vogue in 1991 when SendFax modems were, for a short time, far less expensive

than modems that could both send and receive faxes. Again, unless you have a SendFax modem, there's no reason to look for SendFax support in software.

TOUCH OF CLASS

Virtually all fax modems today support the Class 1 or Class 2 command set, or both. The big difference is that with Class 1, the computer handles all the processing involved in communications. With Class 2, the modem handles much of the work.

Class 2 was originally designed for an earlier, slower generation of computers. The idea was to offload some of the work so that background faxing wouldn't interrupt foreground processing. The CPUs in today's computers, however, are powerful enough to handle all the processing in the background with clock ticks to spare. That means that Class 1 modems can fax in the background just as smoothly as Class 2 modems. There's an important advantage to Class 1 that we'll come back to a little later—after we iron out a potentially confusing wrinkle concerning Class 2.

Most Class 2 modems use an interim version of the Class 2 standard, which was introduced in August 1990. The Class 2 standard was further revised, however; the final version was approved in November 1992. Because there are so many modems that follow the 1990 interim standard, and because most fax software already supports those modems, the 1990

HIGHLIGHTS

Fax Software

FAXING AT 14,400 bps—for those with up-to-date hardware—is a convenience that means you'll have a little more time to yourself. The CAS standard that looked so strong when we last reviewed fax software is fading out of the picture; with today's fast CPUs, Class 1 dominates.

INTEGRATION is an important watchword with the new breed of fax software. In some cases, you'll be able to get more mileage out of your PIM by faxing from its phone book—and having the activity recorded in your contact database. Some fax packages

also include integration with your LAN-based e-mail.

FAX MANAGEMENT—storing, organizing, retrieving, archiving, recycling, and keyword-searching your faxes—is now a highly developed art, especially in the top rank of PC fax products.

FILE TRANSFER, now a fairly established fax function, takes most of the hassle out of moving editable files around. This time next year, fax programs with the right stuff will be able to decide—by “talking” to the receiving fax device—whether to send your

document as an image or as a fully editable computer file.

COVER-PAGE aficionados can now play to their hearts' content; the best of today's fax packages let you roll your own pages, designing with graphics and adding signatures and “rubber stamps.”

TALKING FAX? Well, not exactly, but the first wave of fax/voice integration is here. New voice-and-data modems already let us use the same software for sending and receiving faxes—and taking phone messages. Tomorrow the world.

version of the Class 2 standard is pretty much here to stay. To differentiate between the two, the final version of the specification is known as Class 2.0.

At this writing, there isn't any software that supports Class 2.0, because there aren't any Class 2.0 modems to support. By the time you read this, however, that may have changed, and of course you'll want to make sure that the software you get supports your modem.

BACK TO THE FUTURE

Some of the leading-edge fax features we mentioned earlier are already here in this batch of products; some we expect to see shortly. BitFax Pro, for example, provides a module that handles voice messages much as its fax module handles faxing. As modems with voice processing become more common, you can expect to see

more such voice-message features in fax programs. More important, you can expect voice and fax—and probably e-mail as well—to become increasingly integrated as three aspects of a single message system. It may not be long, for example, before you can call your computer and instruct it to fax your e-mail messages to a designated phone number. This kind of integration isn't available yet, but software vendors are already talking about implementing it.

For the moment, probably the single most important leading-edge fax feature is BFT, which can make file transfer as simple as faxing.

To get a sense of the potential power of BFT, picture putting a floppy disk into a drive connected to a fax machine, setting up a phone call just as you would for a fax, and walking away. The fax machine calls,

determines whether to send the file as a fax image or as an editable file, and then sends it. If you're on the receiving side, you simply remove the disk from the drive and copy the file over to your computer's hard disk. And if you're sending from or receiving on a computer-based fax program, you don't even have to move the file between computer and fax machine.

HASSLE-FREE

What's missing from this picture is the need to twiddle with settings for communications parameters or coordinate with another person at the keyboard of a receiving computer. What's missing, in short, is all the hassles that lead most people to send faxes instead of files.

In a sense, there's nothing new about BFT. Intel included a file-transfer mode in its Connection CoProcessor as long ago

Suitability to Task:

Fax Software

Fax software packages are not only more technologically sound than ever before, they also offer enhancements that take users far beyond traditional fax transmission and management. These enhancements include a number of utilities geared toward all users—and toward mobile users in particular. Improvements include fax-forwarding facilities, fax mailboxes with pager notification, and a breadth of address-book setup options, as well as the ability to serve as an e-mail front end. Today's products offer both ease and convenience without sacrificing faxing fundamentals.

Our **fax-sending** task involves installation as well as sending. We look at ease of installation, checking to see whether a package recognizes the comm port and fax modem type, and whether the package works on first installation. Likewise, we look for the ability to set up system parameters (such as scanner support and multiple dialing prefixes and suffixes) during installation, and we check to see whether the package replaces the Windows comm driver.

We look also at phone-book functionality; a package should be able to import multiple phone-book types, and the ability to utilize the phone books of personal information managers and contact managers is a decided advantage. A package's phone book should provide an ample set of fields, including

user-definable fields. Furthermore, a package should be able to compile phone-book entries into temporary and permanent fax-messaging groups.

A package should be able to create custom cover pages using both text and graphical elements. Ideally, it should include phone-book fields on cover pages and should be able to schedule faxing for delivery at user-specified or standard off-peak times, both to optimize PC utilization and to lower costs.

In addition, a good package should let a user select a file to fax and should be able to convert it and send it without any additional steps on the user's part. A package should also support some form of binary-file transfer by recognizing the support of a compatible package (either a copy of the same package or a package that supports a binary-file transfer standard)

In evaluating **fax receiving**, we look at whether a package can be automatically launched in receive mode and whether it allows nonex-

clusive control of the modem port (so that other software can use the port even while the fax package is standing by to receive faxes). To receive a high rating, a package must allow a variety of default operations—notify, display, store, print, and forward, for example—to be performed automatically on receipt of a fax. A package should also be able to perform OCR on a file received. It should be able to capture the station identification as text and to perform predefined operations based on that identification.

A program's viewer should let the user annotate

received faxes; this means it should let the user erase portions, add text and graphical elements, and highlight portions of the fax. Better packages can also enhance poor-quality faxes by deskewing or applying other automated clean-up procedures.

Fax software must be able to print fax files quickly and accurately. A package should be able to print draft copies quickly, print the active document from a fax file directly, and reproduce a fax well on a variety of printers. A package should also include page-layout options so the user can alter how the fax will appear on the printed page. It should be able to print a document in actual size or shrink it to the available paper size, print two or more fax pages on one sheet of paper, and print only part of one page.

For people who regularly send and receive

faxes, **fax management** is an important issue. A package should let a user decide where—and with what naming scheme—sent and received files should be stored. Also, a

package's fax-viewing facility should let a user zoom in and out of any area on a fax and adjust the view size, and it should provide thumbnail images of received faxes. Each page of an incoming fax should be separate, and users should be able to browse among pages. Furthermore, a package should be able to compress fax files and archive them to floppy disks. Finally, a package's file manager should let a user copy and move fax files from inside a graphical viewer as well as from within a log-transaction view.

SUITABILITY TO TASK		
	Power	Ease of Use
Fax sending	POOR	EXCELLENT
Fax receiving	FAIR	GOOD
Fax management	GOOD	FAIR

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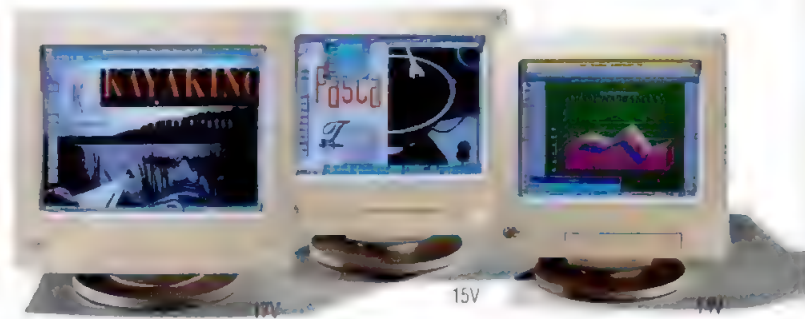
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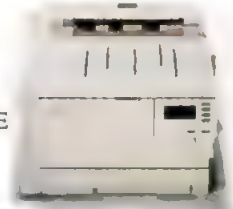
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as 1988. But the feature worked only with other Intel CAS-supported modems. What is new is the promise of a widely used standard.

More precisely, there are two standards: the International Telecommunications Union's ITU-T T.434 and Microsoft's At Work Fax. Note that At Work Fax offers many of the T.434 functions and more, but the two standards can't talk to each other, so you need matching standards on both sides of the link (for more on At Work Fax, see the sidebar "The Future of Windows Faxing?").

Chances are that both will become widely available, just as competing data compression schemes (MNP5 and V.42-bis) coexist in most modems. WinFax PRO, Version 4.0, for example, offers both At Work and T.434, as well as its own version of BFT for file transfer to other copies of WinFax PRO.

What's missing at the moment is the automatic negotiation to determine which flavor to use. Still, it's much easier to specify in your phone book the BFT standard you've chosen than to coordinate with another user each time you want to send a file.

CLASS REDUX

As mentioned, the Class 1 standard has an important advantage over Class 2. That advantage is BFT.

You can't transfer binary files reliably without error correction. And although there is an error correction mode (ECM) defined for faxing, you won't find it on any Class 1 or Class 2 modems. (The Class 2 standard allows ECM, but if anyone has implemented it, it's a well kept secret.)

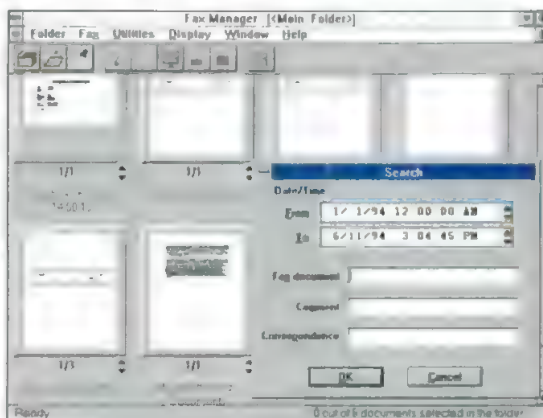
With Class 2 and Class 2.0 modems, the lack of ECM is a fatal flaw, because the processing is done in the modem, which means there is no way to add ECM with software. With Class 1 modems, however, the processing is handled at the computer. That means you can add error correction via software.

Be aware that, as with Class 2, the Class 2.0 standard allows but does not require ECM. Given the current interest in BFT, Class 2.0 modems—once they appear—may well include ECM, but that remains to be seen. For the moment, if you want the advantages of BFT, and your modem supports both Class 1 and Class 2, your best bet is to get software that sup-

ports your modem in its Class 1 mode and offers BFT support.

WHAT TO LOOK FOR

Aside from the leading-edge features, most of today's fax software offers evolutionary changes over what we've seen be-



The BitFax Pro fax manager lets you store faxes in folders and lets you see scrollable thumbnail images of multiple faxes within any given folder.

fore: a better phone book and improved file management features, for example.

In picking your way through the reviews and the accompanying features table, give careful thought to the features you'll actually use. It's easy to get carried away with a glowing recommendation for

a program's OCR, for example. But keep in mind that OCR won't work on handwritten faxes and isn't reliable enough for translating numbers. A 99 percent accuracy rate translates to 40 mistakes on a single-spaced page. And note that Delrina's survey of its WinFax PRO users, for example, turned up only about 13 percent who use OCR regularly.

Much more important for most users are bread-and-butter issues such as whether you can share the phone book with your favorite PIM—or at least import some phone-book file you already have. You should also consider whether a program can handle groups, annotate faxes, and forward faxes. And if you plan to receive and store faxes on your hard disk, take a look at fax management features, which include fax-file compression.

And then there's scanner support. If you own a scanner, you'll want a program that supports it. If you're thinking of buying a scanner, you'll want a fax program that supports the Twain standard. The more you expect to scan, the more important it is to get a program that will let you scan and send in a single step—as with a fax machine. If you anticipate frequent scanning and faxing, you may find that this convenience even eliminates the need for a fax machine.

*Cheyenne Communications Inc.,
Standalone Division*

• BitFax Professional for Windows

BY M. DAVID STONE

BitFax Professional for Windows, Version 3.02—from Cheyenne Communications, Standalone Division (formerly Bit Software)—is a \$129 marvel that offers fax capabilities, data communications, and voice mail in a single package. It doesn't have every fax feature you could possibly want, but it offers many of them—including all the ones you're ever likely to need.

Installation and setup are simple, requiring little more than changing disks. We installed BitFax Pro on three systems, and it had no problems finding three mod-

► FACT FILE

BitFax Professional for Windows, Version 3.02

List price: \$129 **Requires:** 4MB RAM, 10MB hard disk space, fax modem, Microsoft Windows 3.x

In short: Cheyenne Communications' BitFax Professional for Windows misses a few tricks (the package doesn't offer an easy way to archive files or the ability to scan and send faxes, for example), but what it does, it does quite well. It offers relatively unobtrusive background operation and fax management features that take good advantage of the graphical environment. BitFax Pro complements the fax module with data communications and voice mail.

Cheyenne Communications Inc., Standalone Division,
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SUITABILITY TO TASK

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Fax receiving	GOOD	GOOD
Fax management	GOOD	GOOD

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Serve It Up: Fax Servers Proliferate

By Rick Ayre and Craig Ellison

Networks in general and the client/server architecture in particular offer attractive platforms for many kinds of multi-user services, and computer-based fax solutions are no exception. Indeed, LAN-based fax servers are cropping up today in unprecedented numbers.

According to officials at Novell, there are 28,000 fax servers running on Novell networks today. The same sources predict that by 1996, they will number around 175,000. Clearly, work-group faxing is gaining momentum in today's offices. At the same time, standalone fax modems are getting cheaper, faster, and easier to use. How do fax servers stack up against today's ubiquitous desktop fax modems?

Fax servers can handle faxing demands well beyond the capabilities of standalone solutions. Because faxes can be queued up on a network, you can free end users' systems from enormous faxing loads. And fax tracking and phone-book management can be organized in a centralized, well-managed fashion, thanks to administrative control of network servers.

THE HARD AND SOFT OF IT

A fax server involves a dedicated PC or a proprietary box with its own phone lines, queuing, and fax and phone-book management features. Fax-server products come in a variety of configurations: Software-only servers run either as NLMs on your file server or on dedicated network stations connected to the network by modems (via comm-port or intelligent multiport serial-card connections). Examples are FACSys, from Optus Software (908-271-9568), Faxserve, from Cheyenne Software (516-484-5110), FaxWorks PRO Server, from SofNet (404-984-8088), Lanfax Director, from Alcom Corp. (415-694-7000), and RightFAX, from RightFAX (602-327-1357, ext. 105). Despite being comparatively economical, these prod-

ucts tend to be the most difficult to install and configure.

Hardware/software fax servers—like Netfax, from OAZ Communications (510-226-0171)—require proprietary fax boards and dedicated PCs. They are easier to set up than software-only products, but they don't let you use any existing fax hardware. There are also plug-and-play "black box" fax servers, such as FaxPress from Castelle (408-496-0474), which are easy to install and don't require dedicated servers.

Of course, servers aren't the only PC-based multiuser fax solution. Shared fax modems are an alternative. A modem-equipped network workstation runs special software that "publishes" its fax modem's availability to others on the network. Network-aware fax packages like Delrina Corp.'s WinFax PRO can then direct jobs to such shared modems. Log files, if any, are generally kept on individual senders' local workstations. The shared-modem approach may be fine for light-to-moderate fax traffic, but if you need to broadcast a fax to, say, 400 recipients, a fax server will do the job best.

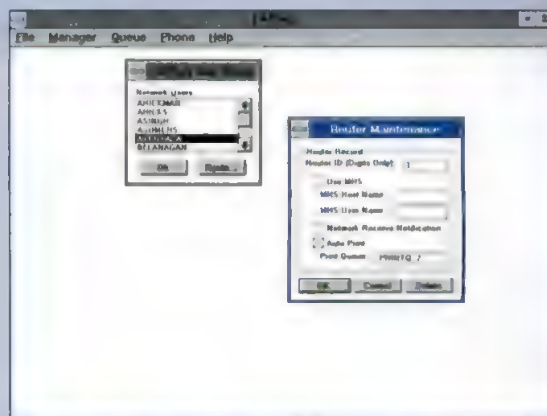
It's difficult to compare the cost of fax servers with that of standalone fax systems, because the former involves less quantitative cost structures (such as administrative time and license fees) than the latter, which most often involves the cost of a modem and a fax package. It's likely that sheer volume and efficiency demands will be as important as cost when you make your purchasing decision.

TAKING ADVANTAGE

Several advantages, such as the ability to handle heavy workloads, distinguish fax servers from standalone fax sys-

tems. Among the benefits:

- **Efficiency and capacity.** A fax server can have two, four, eight, or more lines, depending on the product you purchase. Also, a fax server can queue jobs much as NetWare queues print jobs, automatically balancing loads to ensure maximum efficiency. The bottom-line advantage is that the person launching



Optus Software's FACSys provides a fairly detailed Router Maintenance dialog box.

the 400 faxes regains control of his or her workstation quickly and can turn to other tasks while the fax server handles the grunt work.

- **Phone-book flexibility.** Another important success factor is the number and type of phone books available to users—and their ease of use. As a minimum, a network fax server should make one public and one private directory available to each user. Users should be able to create recipient groups—ad hoc or permanent—made up of names drawn from multiple phone books. And for those with preexisting phone books stored in PIMs or other databases, a fax server's data-import feature is especially crucial.

- **Organizing traffic.** With multiline products, you generally can configure each modem or line to accept incoming faxes only, send faxes only, or do both. Some products also allow certain lines and modems to be dedicated to a partic-

ular department. So on a four-line fax server, say, three lines could be dedicated to outgoing marketing faxes and one line to incoming purchase orders.

• **Tracking, security, and reporting.** Fax servers provide tracking for incoming and outgoing faxes that you can't get any other way. Typically, this happens on both client and administrator levels: Clients can check the status of their own pending and sent faxes; administrators can view the status of all fax jobs for all clients. Moreover, fax servers can provide security by letting the administrator control access to incoming faxes, thereby allowing only certain individuals to view sensitive faxes. Generally, users can see jobs only in queues they have initiated or in queues that have been routed to them. With some packages, there is also a level of security for a fax router. The person working at that level can see the first page of a fax so he or she knows how to route it.

Servers also permit centralized administration and reporting for the entire fax system. The latter can provide key statistics to allow you to track and, where appropriate, bill back fax charges to departments or individual clients. Most fax servers will export data as CSV files that can easily be imported into database or spreadsheet programs for further analysis or reporting.

THE DARK SIDE OF THE FAX

For all of their advantages, however, fax servers also have their dark sides. They can be very difficult to set up, for example, and there isn't a standard, reliable way for them to route incoming faxes to their intended recipients.

There are three ways to handle inbound faxes. One method, *store and forward*, moves incoming faxes to a user's workstation. Less space is needed on the server, but more network traffic is created. A second option, *view original*, keeps the received fax on the server, where the user views it and decides its fate. The server must have storage space, but network traffic is minimized.

The third choice is to print the faxes as they arrive and then delete them. Some fax servers double as print servers, so if you dedicate one of your lines to, say, incoming faxes for the accounting department, you could print faxes directly on a networked printer located in the accounting department. Because the network storage space is reclaimed quickly, this method tends to be popular with network administrators.

FEATURES THAT MATTER

The following features should be relevant to your quest for a fax server:

• **Platform.** Your server will need to provide client-software support for the platforms you use. Those we have mentioned offer DOS and Windows clients. SofNet's SofNet OS/2 has an OS/2-based server and supports DOS, Windows, and OS/2 clients on NetWare LANs.

• **Installation and ease of use.** An installation program should take care of the entire setup process, copying the software and also making all system modifications. The server should also be easy to support and modify once setup is complete. You should be able to run the installation program from a network workstation as well as remotely.

• **Administrative features.** A package should provide the administrator with an event-logging feature, so that problems can be rapidly traced. Flexible support for multiple phone books is also important, as is the ability to construct phone books from user files or the NetWare Bindery.

• **E-mail.** We also think that in this day and age, these programs should be tightly integrated to e-mail systems. This means packages should support VIM, MAPI, MHS, and possibly other protocols. Users should have all the functionality that fax client software provides right inside their favorite e-mail clients. That support should include the ability to send, receive, reply, forward, annotate, and receive notification about the status of faxes. □

els of modem and setting up correctly for each one. The only information you need to supply is basics like name, company, and fax number.

Sending faxes is equally straightforward. As you would expect, you can fax from any Windows program by printing to the BitFax Pro driver. Alternatively, you can open the Transmit Fax module and enter a typed note as part of a cover sheet, or you can send files already saved in fax format—including files you've scanned.

BitFax Pro supports Twain scanners only. More problematical is that it can't scan and send in a single step, which can be annoying if you need to scan and fax often. Note too that you won't find a set of predefined cover sheets, and you can't edit cover-sheet designs. You can, however, attach logo and signature files and save cover sheets for reuse.

QUICK-DIAL SPECIALIST

Once you give the command to print or create a new fax, BitFax Pro opens its Dial Fax dialog box so you can designate a recipient. The program offers eight quick-dial entries for the people you fax to most often. There's also a phone book that can store any number of entries. In addition, you can enter a name and number when you're sending a fax and optionally add it to the phone book. You can also create groups—temporary or permanent—by picking names from the phone book.

Other choices in the dialog box let you preview a fax, specify whether to send a cover page, enter text for a cover page, output to a file for sending later, or add already saved fax files as attachments. In addition, faxes can be scheduled for sending at specified times or at standardized off-peak times.

Whether sending or receiving, BitFax Pro interrupts foreground tasks occasionally during data transfer. But unless you specify otherwise, it will take over your system entirely when it's generating a fax to send or saving a received fax to disk. By default, the program compresses faxes on receipt and notifies you when it finishes receiving a fax. It can also automatically print, forward, or "recognize" faxes on receipt. (BitFax Pro uses one of the best OCR modules available, Caere Corp.'s AnyFax.)

This is a business software program



Do not

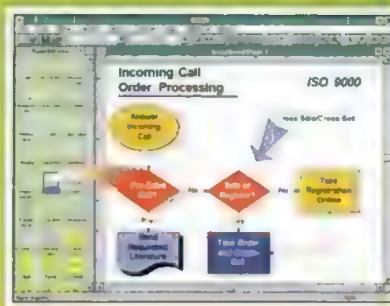
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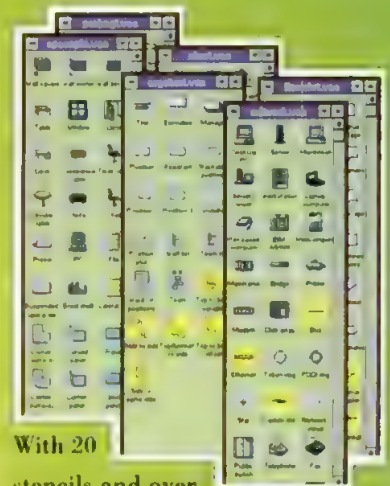
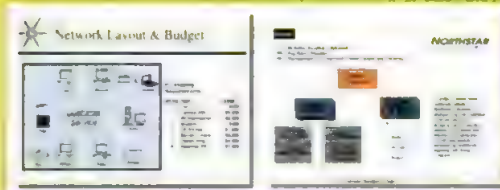
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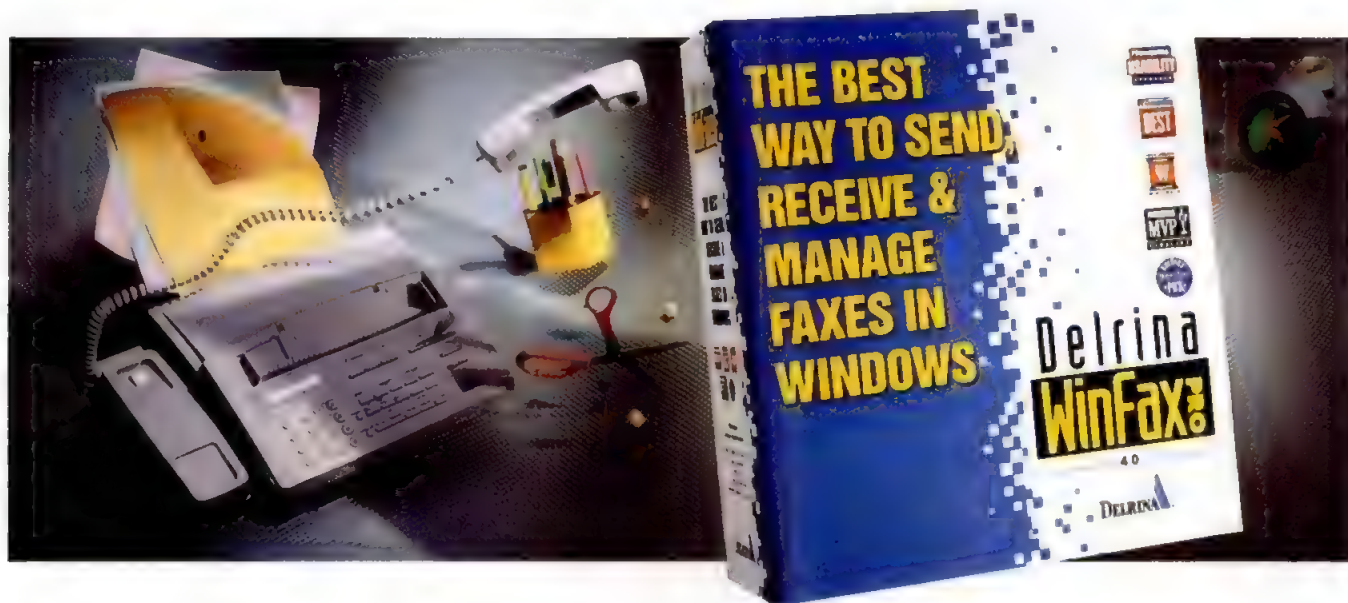
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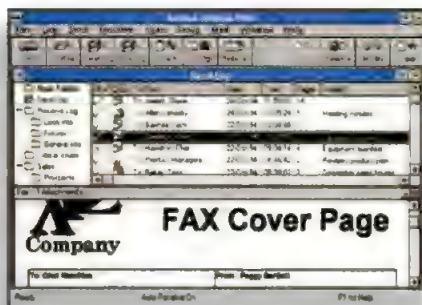
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*Requires Class 1 modem.

CIRCLE 250 ON READER SERVICE CARD

COMING AND GOING

BitFax Pro's receive and transmit logs are worth special notice. When you highlight an item in either log, the package displays pertinent details at the bottom of the window—including any comments, which you can add. Even better, you can see a thumbnail of the first page—and even scroll through the pages—before deciding whether to print the fax, view it full-size, delete it, or move on. Logs can be sorted on any of several fields, and you can search through the logs using additional fields.

The program scores well but not exceptionally in other areas of file management. A full set of drawing tools is available for annotating faxes, and you can copy, move, or save files or selected ranges of pages in several formats—including .BMP, .PCX, and TIFF. Most impressive, you can store faxes in folders and either visually glance through thumbnail images in the folders or use the same search feature as in the Receive Log to look for a fax. Note, however, that you can't rearrange pages—by moving thumbnails for example—and there is no archiving capability beyond simply saving individual faxes to a different directory or disk.

Finally, don't overlook the BitCom Pro communications module, Voice Manager, which Cheyenne says will work with Zoom and Zoltrix voice modems (and other modems with the Rockwell voice/fax/data chip set) for voice mail. The total package can turn your system into a communications center. And even if all you need is faxing capabilities, you should still be impressed by the combination of relatively unobtrusive background operation and better-than-average fax management.

Trio Information Systems

• DataFax+

BY STEVEN C. M. CHEN

Trio Information Systems' \$129 DataFax+, Version 4.2, provides outstanding features for both novices and advanced users. Fortunately, the former can work well without ever going near the advanced features, which have a steeper learning curve and can be hard to find and access.

The full package includes quite a number of elements: the Windows version of DataFax, an OCR module based on the Ligature engine (which handles

text retrieval by indexing incoming faxes after OCR), a DOS client, and a pocket-size telephone-line simulator called Fax-converter, which allows a fax machine to act as a scanner or printer. Pricing goes as low as \$49 for the Windows-only ver-

(but could be better organized) and includes a quick-reference card. DataFax+ supports 12 different languages, which you can specify on installation and when you create a cover page.

For most tasks, DataFax+ does an excellent job of maintaining a consistent and easy-to-use interface. But options used infrequently—such as faxing statistics or forwarding faxes—can be hard to find and access. Trio representatives say the next release, due shortly, will have better-organized documentation and a friendlier user interface.

READY FOR FAXING

Three DataFax+ programs load when you start Windows. DataFax+ Server is responsible for sending and receiving faxes and showing job status. Inbound

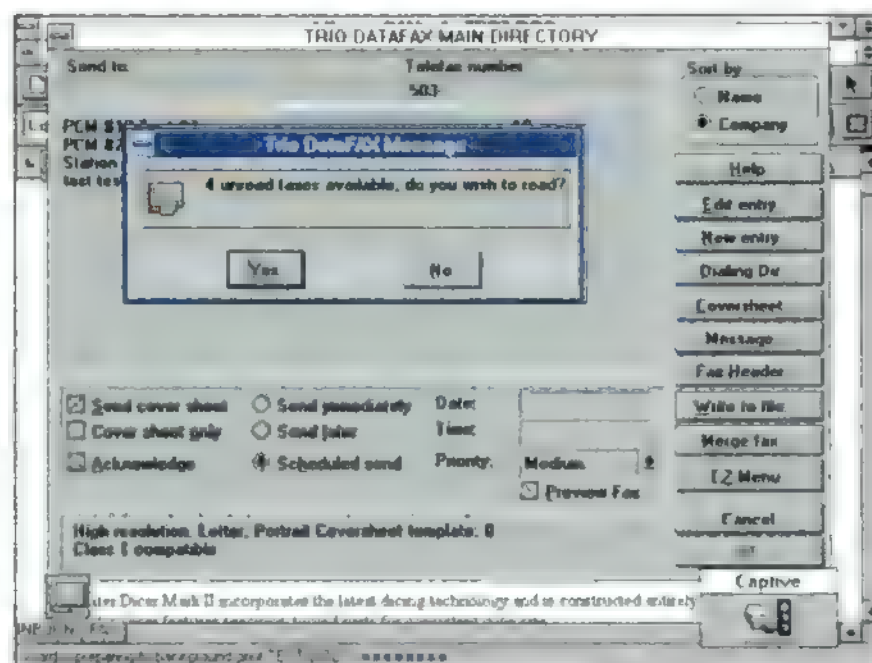
Fax is a log for incoming faxes; it reminds you periodically and at start-up of unread incoming faxes. Captive offers quick access to some commonly used fax functions such as quick-fax and can be used to update phone books and copy items to and from its clipboard.

There are several ways to send faxes with DataFax+, the most common being printing documents to the DataFax+ driver from within any Windows application. Whatever method you choose, the main directory provides the options. Here you can compose a fax, select cover sheets and recipients (or groups), and specify a transmission time. You can preview faxes before sending.

For beginners, DataFax+ offers an EZ Menu with a reduced option set. From this menu, you can rearrange fax pages, insert previously saved fax files, or annotate faxes with text, lines, arrows, rectangles, and circles.

Captive lets you fax a quick note or capture part of the screen for sending. To send multiple files, you can use drag-and-drop between Captive and the Windows File Manager. The program supports Twain and other scanners.

DataFax+ Faxoffice, a standalone fax administrator module, displays the status of all faxes, sets system parameters, and even calculates transmission statistics. With Faxoffice, you can create custom



DataFax+ offers a consistent interface for sending faxes, and beginners have the option to start with the EZ Menu.

sion without OCR. DataFax+ can also work with two phone lines using two standard fax modems, with one line set up for incoming and the other for outgoing faxes.

Installing the full DataFax+ package requires about 8MB on your hard disk; minimum installation takes 3.3MB. The documentation is clear and well written

▶ FACT FILE

DataFax+, Version 4.2

List price: \$129. **Requires:** 4MB RAM, 8MB hard disk space, fax modem, DOS 3.x, Microsoft Windows 3.x

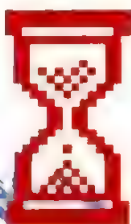
In short: Trio Information Systems' DataFax+ is a full-featured fax package that addresses the needs of both beginners and advanced users. While beginners will appreciate being shielded from the package's more advanced features, power users may have considerable trouble accessing them. DataFax+ includes OCR, scanner support, a fax administrator module, and text retrieval that can index all of a user's incoming faxes. The next release, scheduled to arrive shortly, will feature a more intuitive interface, as well as better documentation.

Trio Information Systems Inc., 8601 Six Forks Rd., #105, Raleigh, NC 27615; 919-846-4990; fax, 919-846-4997.

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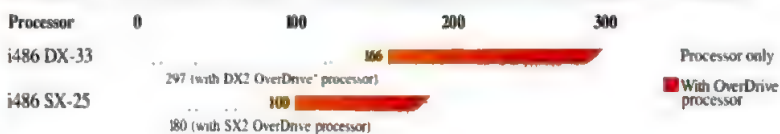
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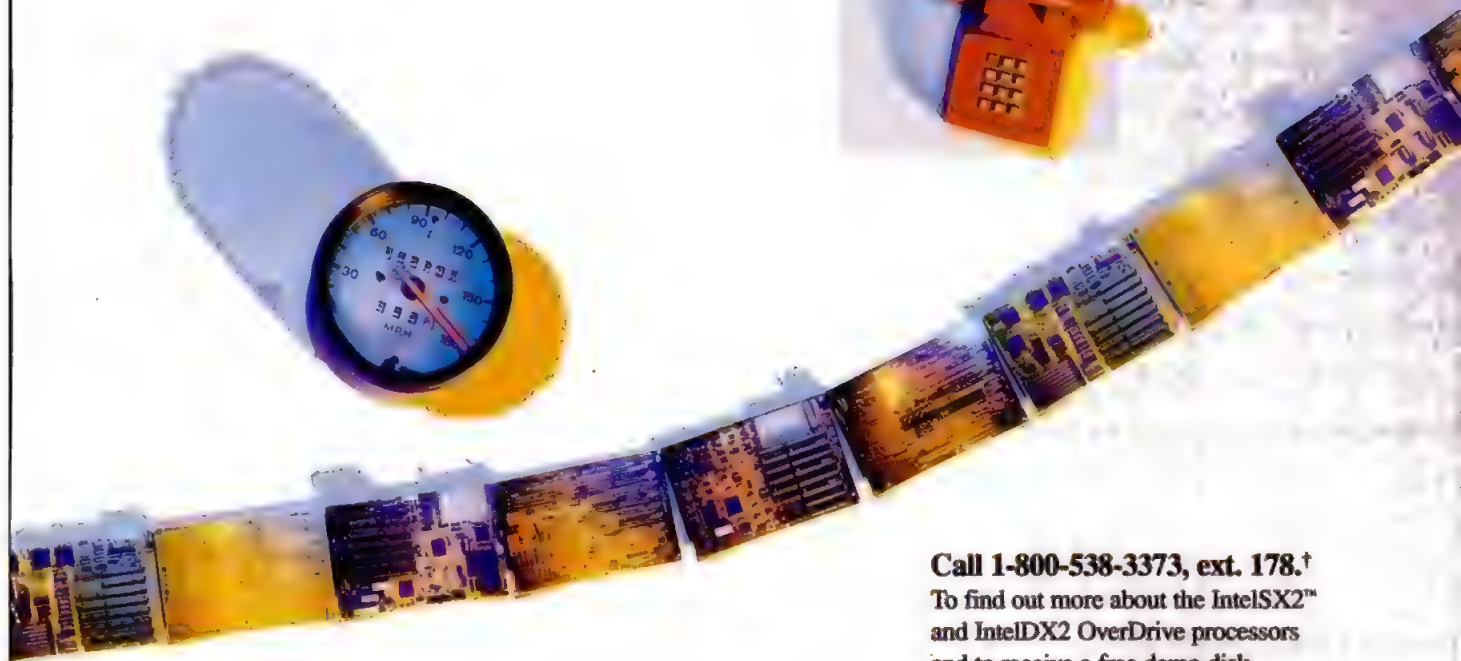
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cover sheets with your logo, the date, the total number of pages, and the like, but it is nevertheless one of the least friendly modules in the entire package.

KEEPING TRACK

DataFax+ lacks an archiving feature but does offer full statistics on your faxes; such information includes the total number of pages, sender ID, time, date, unread files, and printed files. There are separate log files for outgoing, received, transmitted, and failed faxes. To view faxes, you simply double-click on the filenames in the log. The same viewer is used for incoming and outgoing faxes.

To help you keep track of incoming faxes, Trio builds into DataFax+ a "lite" version of its indexing program, DataSearch. It retrieves incoming faxes that have been processed through OCR. When a fax is received in the background, a window pops up to let you know you have an unread fax. A beeping sound, which you can turn off, will continually remind you of the items. The OCR accuracy is fairly good, and page formatting is maintained in any of 20 file formats.

DataFax+ can meet a wide range of faxing needs—from basic to complex—and then some. Its value is in its ability to shield beginners from more complex features while allowing power users to learn the intricacies as needed. The drawback is that DataFax+'s power features aren't as accessible as some users might want.

Phoenix Technologies Ltd.

• Eclipse FAX

BY M. DAVID STONE

The last time *PC Magazine* looked at fax programs, Eclipse FAX earned an Editors' Choice, primarily because of its unequaled fax management. Now in Version 6.0 (having skipped Versions 2.0 through 5.0), and now a product made by Phoenix Technologies, this \$84.95 program retains everything that was praiseworthy in Version 1.x and adds significant new features. Nevertheless, it has largely stood still in fax management while other programs have caught up with it or passed it by.

MANAGING JUST FINE

The indexing feature remains a capable component. To index a fax, you give it a

name or description of up to 50 characters and, optionally, add a note of up to 500 characters. You can then search for faxes by index entry or by sorting—by date and time or alphabetically by sender or recipient.

Noticeably absent is the ability to look through thumbnail images. Also, while you can open a file and save it elsewhere in a choice of formats—such as .DCX,

.PCX, and TIFF—there is no easy way to move, copy, or archive files.

Most of the program's new features are in Fax Assistant, a module that lets you set a wide range of options—different global defaults for each of your phone books, for example, which can be overridden by individual phone-book entries.

With Fax Assistant, you can tell Eclipse to send a fax to a given individual

■ Fax: The "Lite" Side of the Picture

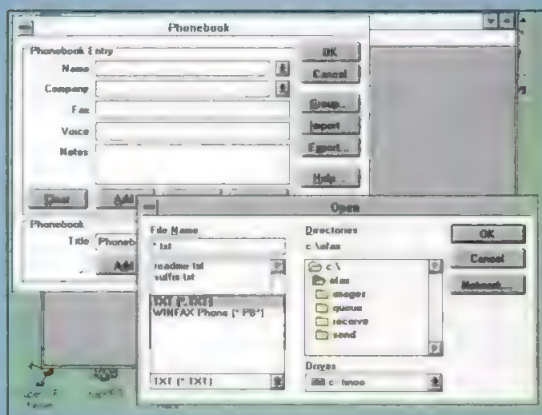
By Amarendra Singh

Chances are that when you bought your fax modem it came equipped with software. Many of the packages bundled with fax modems are "lite"

logo and address-book fields. You lose the OCR capabilities, scanner support, and many of the other features included in WinFax PRO, Version 4.0 (or even Version 3.0). Delrina

does offer a \$49 competitive upgrade to the full product.

• Phoenix Technologies' **Eclipse FAX SE, Version 1.20**. This is somewhat richer in features than WinFax Lite, but it offers a good deal less than its full-version counterpart: Eclipse FAX, Version 6.0. It lacks OCR support (included in the full version), but it retains scanner support. The address book is flexible



Eclipse FAX SE lets you import address books in WinFax format and in text format.

(reduced-feature) variations of full-featured products. While these will get you started, they may or may not work well as a long-term choice.

Generally, these fax packages are simple send-and-receive products, with little in the way of fax management capabilities or other enhancements. If you find that you fax regularly, upgrading to the high-end program will be worth the expense. Here is a look at the low-end versions of three of the products in our main roundup.

• **WinFax Lite, Version 3.0**, from Delrina. Delrina's WinFax Lite, Version 3.0, is the least feature-rich low-end product, providing only basic functionality. It offers only one type of cover page, although you can add

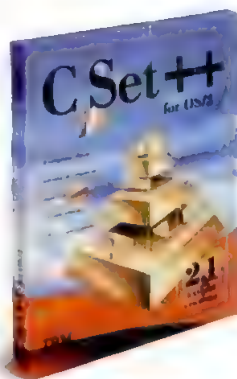
and lets you import and export address-book data in text format. Though the cover sheet is simple, you can add elements such as a logo to it.

• Cheyenne Communications' **BitFax Lite, Version 3.07**. Of the low-end packages we looked at, BitFax Lite, Version 3.07, was the most complete. OCR was the only feature from the main product that was missing. You can choose to install features as varied as data communications and the Voice Manager. The installation takes up 3MB at minimum, 6MB at maximum, making this the largest of the low-end packages. But since BitFax Lite is essentially the same as the main package—minus a few features—it serves as a fine product on its own. □

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either as soon as you create it, at a specified time, or at a standardized off-peak time that you can define. It also lets you tell Eclipse—on an individual or global basis—to notify you of received faxes and either print them, recognize them (using Ocron's OCR module), or send receipt confirmation. You can specify whether to save faxes sent to or by each individual, where to save them (and in what format), and whether to send a copy of the fax in question to another individual. (By default, Eclipse compresses faxes on receipt.) One of the few features you won't find is polling.

Alas, Fax Assistant is less useful than it might be, because Eclipse ignores almost all of the settings when sending to groups. Phoenix says it made this design decision because some of the settings can be time-consuming to use. A better choice might have been to let the user decide whether to ignore the settings.

STEADY ON ITS FEET

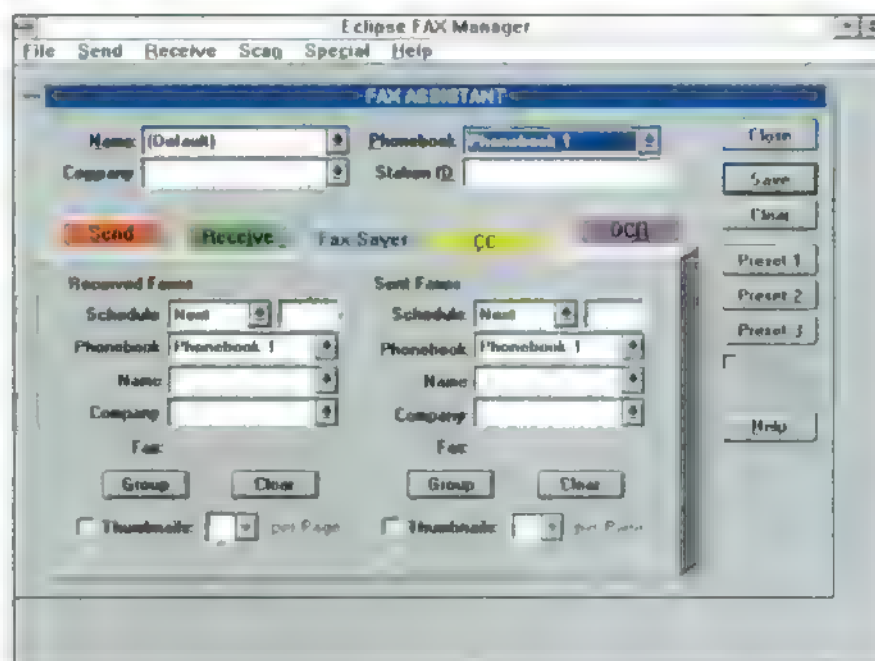
As you might expect, Eclipse offers all the basics. Printing from any Windows program to the Eclipse driver, for example, and setting Eclipse to send a note as part of a cover sheet are both easy options. In either case, you can choose a name or group from a phone book, add or update phone-book entries, specify a time to send, and change other settings. Also, you can specify whether to preview a fax and choose a cover sheet (you can do the latter through the Send dialog as well). There are about 25 cover sheets, and you can modify these or add more using a graphical editor. You can also specify letterhead and a second sheet.

Whether sending or receiving, Eclipse takes over your system only when generating a fax or saving a received fax to disk. Printing to a laser printer is suitably swift; as expected, the quality of output compares with that of a typical fax machine.

Eclipse can scan and fax (or view, print, or recognize) in a single step, a convenience if you need to fax existing documents. You can also annotate faxes, view them in thumbnail format, and re-

arrange the pages. Eclipse can also use the phone books built into Polaris's personal information managers Advantage and PackRat.

Eclipse is a highly capable program. The ability to scan and fax in one step is a significant convenience that's not avail-



Eclipse's Fax Assistant lets you set a wide range of options as the defaults for each phone book and includes carbon-copy lists for sent and received faxes.

able in many programs. And while the indexing and fax management features haven't changed much, they can still hold their own against the competition. At \$84.95, and with an upgrade price of just \$29.95, Eclipse may actually qualify as a bargain.

FACT FILE

Eclipse FAX, Version 6.0

List price: \$84.95. **Requires:** 4MB RAM, 5MB hard disk space, fax modem, mouse, Microsoft Windows 3.1 or later. **In short:** Phoenix Technologies' Eclipse FAX has many strong points, which include an indexing feature for fax management (for which it earned an Editors' Choice in our last roundup) and the ability to scan and fax in a single step. It also lets you set options such as when to send faxes and whether to send carbon copies of faxes on a global or individual basis. For the price-conscious, Eclipse's \$84.95 price tag may be the best reason to buy this package.

Phoenix Technologies Ltd., 846 University Ave., Norwood, MA 02062-3950; 800-452-0120, 617-551-4000; fax, 617-551-3725.

SUITABILITY TO TASK		
	Power	Ease of Use
Fax sending	GOOD	FAIR
Fax receiving	GOOD	GOOD
Fax management	GOOD	GOOD

476 on reader service card

WordPerfect Corp.

ExpressFax+

BY STEVEN C. M. CHEN

Earlier versions of ExpressFax+ were available only as OEM products, bundled with fax modems. Now ExpressFax+, Version 3.0, makes its debut as a commercial package. Emphasizing ease of use rather than richness of features, WordPerfect Corp.'s \$109 package is essentially for beginners and those with light faxing demands. Nonetheless, first-time users will find installation challenging and the help lacking.

MANUAL LABOR

No one likes manuals much, but that doesn't mean they're not important. WordPerfect, however, has omitted documentation entirely; the only paper-based help provided is a pocket-size fold out guide. You have to rely on the package's mediocre on-line help, which is not context-sensitive.

Furthermore, the on-line help is available only once the program is installed and thus not available during installation, when you're most likely to need it. As for phone support, we were put on hold by technical support for more than 15 minutes on several occasions during our review process.

That said, once you overcome the initial hurdles, ExpressFax+ is fairly easy to master, even without a manual. The main program is the Windows-based ExpressFax+ Desktop, which lets you check for both incoming and outgoing faxes, maintain phone books, change system parameters, and fax quick notes. Running in the background are two memory-resident programs, FaxDir (which handles faxing) and the modem driver. Together they take up more than 70K of memory.

BIG SENDER

The only way you can fax a document in ExpressFax+ is from within an application. You can send faxes to multiple recipients or groups and add new entries to the phone book on the fly. You can schedule faxes only by using one of six default time settings, including Send Immediately, 2 AM, or Schedule Your Own Time and Date. For monitoring the status of the modem,

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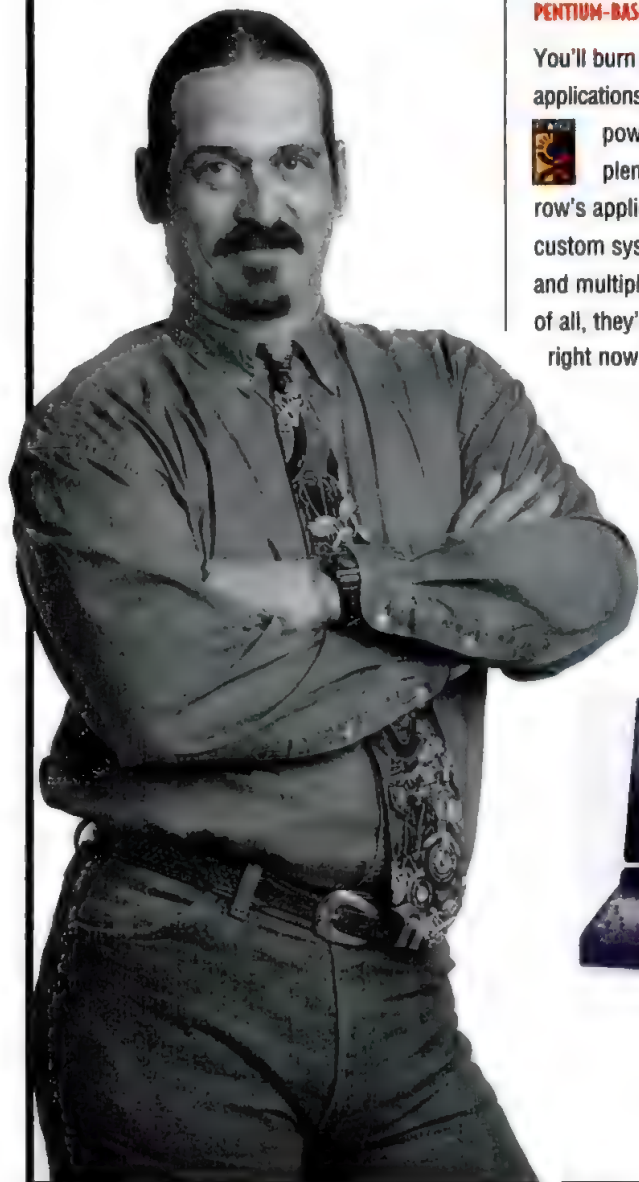
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CIRCLE 012 ON READER SERVICE CARD

■ The Future of Windows Faxing?

By Ben Z. Gottesman

With Microsoft Windows for Workgroups 3.11, Microsoft may just be giving us a glimpse of faxing's future—a view that's gaining clarity as Microsoft divulges more information about the long-awaited next version of Windows, code-named Chicago.

Seeing faxing as just another mode of electronic communications, Microsoft is now beginning to build fax functionality into its overall communications architecture, currently embodied in the version of Microsoft Mail that ships with Windows for Workgroups. Known collectively as At Work Fax, the fax functions constitute the first software implementation of Microsoft At Work, part of the company's strategy for integrating PCs with other office equipment.

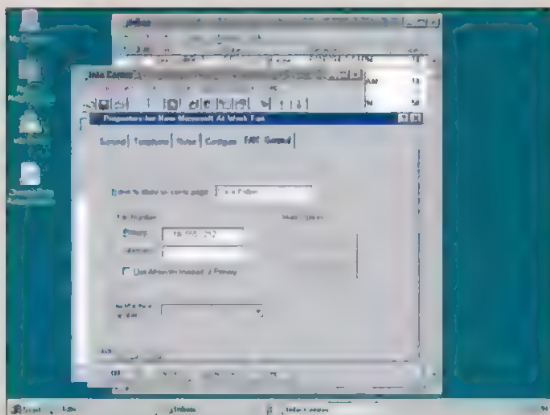
With At Work Fax, users can compose fax messages as if they were ordinary mail messages or print them to a fax/printer driver, as for a typical Windows-based fax program. In either case, users address the messages via the mail front-end, specifying that a fax—and not an e-mail message—is being sent, and providing a phone number. A single message may contain both mail and fax destinations, and inbound faxes appear as mail messages in the user's Inbox.

FAX AS FILE TRANSFER

At Work Fax also incorporates Microsoft's proprietary binary-file transfer technology, known as BFT-NSF (binary-file transfer—Non-Standard Facilities Frame). It offers features similar to what T.434 offers, and then some. An At Work Fax modem can check to see whether a receiving fax machine is

capable of receiving binary files. If it is, the file is transmitted; if not, a fax image is sent instead. This is a significant improvement over the T.434 BFT standard, which breaks the connection if there is an attempt to send binary files to an incompatible fax device.

Windows for Workgroups also lets



Microsoft's next version of Windows will feature the Common Address Book—a central repository accessible via MAPI for e-mail, fax, and on-line-service addresses.

users share fax modems. Inbound faxes are sent to a user designated as the workgroup's fax attendant, who then forwards them to the appropriate recipients via Mail.

At Work Fax is also more security-conscious than other fax programs. Fax messages may be password-protected, and the program supports RSA public-key/private-key encryption.

Despite its future leanings, At Work Fax—in its current form—remains a modest program when compared with the other programs in this roundup. It has minimal fax management and cover-page features, only a very basic file viewer, and no OCR.

CHICAGO, CHICAGO

The integration of fax capabilities with the operating system promises to go even further with Chicago. Communications capabilities in Chicago are centered on the InfoCenter, which will

provide a common mailbox for messages and data sent via electronic mail, on-line services, fax, or even voice mail.

But there's more. Additional Chicago innovations will include Unimodem, the Common Address Book, and Page Description Communications.

Unimodem is a planned modem-configuration tool, similar to the Unidriver used to set up printers under Windows 3.1; in one operation, it will set up your modem for the entire system, regardless of which or how many Windows applications will use it. The Common Address Book will be a central repository for e-mail, faxes, and on-line service addresses, and it will be accessible to any program via MAPI.

On the fax-specific front, Page Description Communications (PDC) may well be the most significant of the planned enhancements. Rather than sending an image, Chicago's fax program will be able to send a description of the document (analogous to the PostScript page descriptions used to create portable documents in Adobe's Acrobat). Unlike binary-file transfer, PDC will not require that the end user have a copy of the originating application to view and search the document. If the receiving device is At Work-compatible, it will reconstruct the live editable file; if not, the document will be sent as a standard fax image.

What will Microsoft's innovations mean for users and vendors of fax software? Portentous as they are from a technology standpoint, Chicago's built-in fax capabilities will still be no match for many of today's fax programs. It is probable, however, that vendors will increasingly leave management of the back-end services to the operating system, choosing instead to add value through enhancements such as improved fax management, mobile-specific features such as fax forwarding and polling, voice integration, and OCR. □

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L.A. showed his collection
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in D.C., he reworked each
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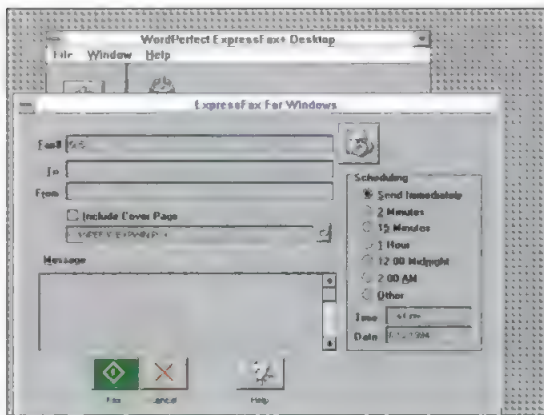
ExpressFax+ includes a program called Modem Watch.

ExpressFax+ doesn't let you design cover sheets. The only option you have in this area is whether or not to include a banner (sender information, date, and time) and a logo at the top of the page.

A FAX WITH A VIEW

To view a fax, you can launch the fax viewer from the in-box or the out-box. A log file lists the status of incoming and outgoing faxes. The viewers for both incoming and outgoing faxes are rudimentary. Features such as thumbnail and multipage views are omitted. Zoom in, zoom out, and page rotations are standard in the viewer, but outgoing cover pages are not viewable. Switching between pages is very slow compared with what you find with fax packages that store pages in compressed format. There's a pop-up window to show the status of a page as it decompresses.

Perhaps surprisingly, ExpressFax+ includes an OCR feature, TextBridge by Xerox Imaging Systems, which translates fax images of text files. No text viewer is included with the package, however; you'll have to launch your own in order to look at converted files. The program pro-



There are plenty of options you can use when you send a quick-fax with ExpressFax+. The package will not let you view your cover sheet, however.

vides no annotation tools.

Incoming faxes are received automatically and placed in the in-box, but no notification is given. You have to check for incoming faxes periodically, and you can only forward an incoming fax manually. The quality of faxes is typical of that found with most fax packages.

Clearly, ExpressFax+ has not yet matured. It has the potential to be an excellent package for users with basic faxing requirements, but its current version falls short of the mark. Power users should definitely look elsewhere.

American TeleRep Inc.

● Fax/PM

BY AMARENDRA SINGH

American TeleRep's \$150 Fax/PM, Version 2.2, is a very basic—albeit genuine 32-bit—OS/2-based fax package. It offers the basic functionality that most fax users require, and since the product supports REXX, expert users can easily extend its features. The ability to fax from within a WinOS/2 session (a Windows session run under OS/2 2.x) alone will probably endear this package to most OS/2 users.

Installing Fax/PM is relatively simple. The installation routine sets up both the program and printer driver (the complete installation uses about 4MB of disk space), but you must install the WinOS/2 printer driver manually. It also cre-

ates a folder that, when opened for the first time, pops up help on how to use the package.

The Fax/PM folder contains several icons and subfolders; those for the viewer, scheduler, and WinOS/2 DDE server are of primary interest. Additional icons access a conversion utility (which allows you to update existing address books and import ASCII address data) and a help file that gives you information about the Fax/PM API. Folders called FaxIn and FaxOut show you the contents of those subdirectories.

ON SCHEDULE?

Most of your interaction with the package—through functions like the address book, scheduling facility, and log file viewer—is via the scheduler icon, one of Fax/PM's odd, illogical offerings. And while the address book itself is adequate, with fields for most of the information you'd want to include, it too has some quirks. For example, since the phone-number field is unstructured (like most data fields in Fax/PM) and will accept long numbers, you can easily include a credit card—number dialing prefix. This is great—unless you include a “banner” on your faxes, in which case your credit card number will be printed in it along with your phone number! (The manual provides a warning about this, but fixing the problem would be a better solution.)

SIMPLE SEND

As with most fax packages, sending a fax from an application with Fax/PM is a simple process: You print to the driver and

FACT FILE

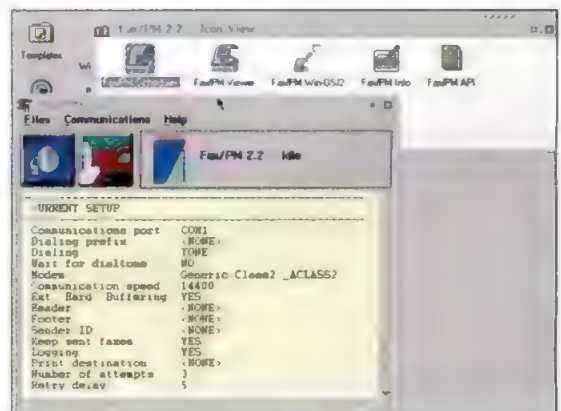
ExpressFax+, Version 3.0

List price: \$109 **Requires:** 4MB RAM, 5MB hard disk space, Microsoft Windows 3.1 or later, fax modem (Class 1 and Class 2). **In short:** WordPerfect Corp.'s ExpressFax+ will disappoint users who have moderate-to-heavy demands. The package offers the basics, including OCR, but is intended for beginners with limited or no expertise in communications. Installation will prove to be particularly challenging—all the more so since ExpressFax+ offers few help options. It's easy to use only because it eliminates features that users will demand down the road.

WordPerfect Corp., 1555 N. Technology Way, Orem, UT 84057, 800-451-5151; fax, 801-222-5077.

	Power	Ease of Use
Fax sending	FAIR	FAIR
Fax receiving	FAIR	GOOD
Fax management	FAIR	GOOD

479 on reader service card



Fax/PM offers a detailed communications log that provides you with specific comm-port information.

It's a Jungle Out There... May the Fittest Survive.

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THIS MONITOR HAS NEITHER.

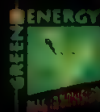
THIS MONITOR DOES NOT.

AND THIS MONITOR SHOULD NOT.

MAC 

CIRCLE 067 ON READER SERVICE CARD

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Performance Tests: Fax Software

What the Numbers Mean

We used Class 1 Group 3 settings when testing all fax transmissions. Since fax standards—more than PC and modem capabilities—define fax transmission rates, we saw very similar transmission times among the packages.

Of note, ZipComm posted excellent receive times, and Express Fax+ took a relatively long time to send the TIFF file. Also, though ZipComm received decent scores on the Excel- and Word for Windows-based tests, image quality was poor.

How We Tested

We set up three test scenarios and, within each scenario, ran tests to determine how long each package would take to perform three functions: convert a file to fax format, send a fax, and receive a fax. For each product we ran

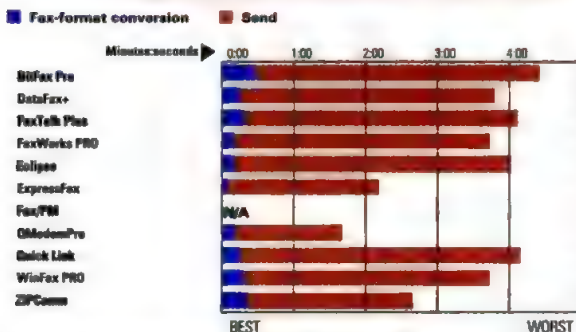
each procedure three times, and we report the average timings.

For our **Microsoft Excel** tests, we used the software to fax a one-page spreadsheet that included a chart to a fax machine. In the **Microsoft Word for Windows** tests, we faxed a two-page business letter to a fax machine. In our tests of **Transmission Between Fax Modems**, we faxed a full-page complex graphic in TIFF format from the fax modem being tested to a **Practical Peripherals 14,400 FSXA** fax modem. Since the modem had a maximum transmission rate of 14,400 bits per second, we faxed the image to it at both 9,600 bps and 14,400 bps.

For each transmission in the first two tests, we measured the duration of the file-conversion, fax-sending, and fax-receiving processes. Since the connection times for both sending and receiving are the same when transmitting from one fax modem to another, we do not report the receive times on the modem-to-modem tests.

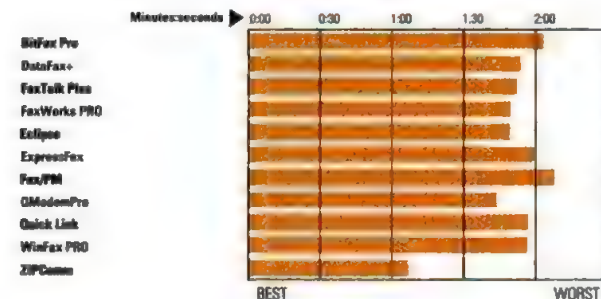
MICROSOFT EXCEL

Fax-format conversion and send



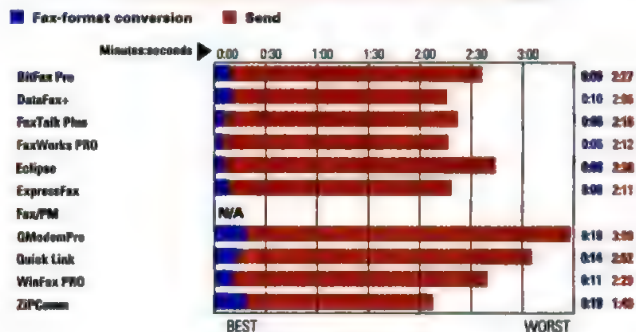
N/A -Not applicable. Fax/PM runs under OS/2, which processes faxes in the background on a separate thread.

Receive

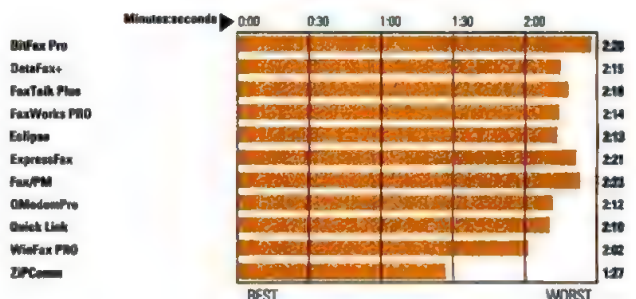


MICROSOFT WORD FOR WINDOWS

Fax-format conversion and send

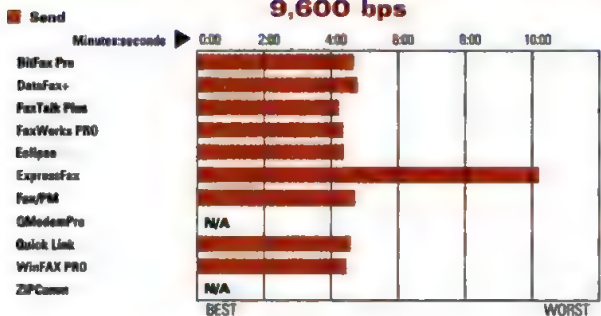


Receive



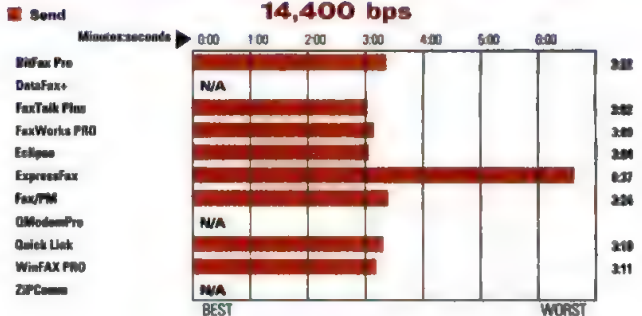
TRANSMISSION BETWEEN FAX MODEMS

9,600 bps



N/A -Not applicable. The product was unable to complete this test satisfactorily.

14,400 bps



Fax/PM takes over from there. (To fax from a WinOS/2 session, you need to make sure that the DDE server is running before you print to the fax driver.)

The timing of fax transmissions, however, is another one of this package's oddities. By default, Fax/PM handles sending on an "as convenient" basis; that is, it intersperses transmission of individual faxes with other activities as it sees fit; there is no way to force the program to transmit immediately. During testing, the application frequently took many minutes before actually sending the fax.

The exception to this rule is when you're faxing to a group, in which case you can specify a transmission time (which could be the present). Even so, you bump up against the annoyance of typing the time—in exact and unintuitive syntax—into the unstructured data field.

Fax/PM files are stored in compressed format. The program decompresses each page as you view it and recompresses it when you leave it. Fax/PM's no-frills viewer allows you to open a file, view it, jump from page to page, and cut and paste portions of the fax image. There are no annotation tools and no file management features to speak of. There's no doubt that heavy-duty fax users will sorely feel the latter omission, and American TeleRep should plan to rectify the problem in the product's next version.

FACT FILE

Fax/PM, Version 2.2

List price: \$150 **Requires:** 8MB RAM, 1MB hard disk space, fax modem (Class 1 or Class 2), mouse, OS/2 2.1 or later. **In short:** In general, Fax/PM's implementation of the Workplace Shell and its use of the object metaphor are not very successful. But for most OS/2 users, the ability to work in a WinOS/2 environment may be enough of a reason to buy this package. To supplement its modest feature set, Fax/PM supports REXX, so expert users can easily extend features.

American TeleRep Inc., P.O. Box 654, 610 Niederwieser Rd., South Windsor, CT 06074, 203-644-1708; fax, 203-648-9587

SUITABILITY TO TASK

	Power	Ease of Use
Fax sending	FAIR	FAIR
Fax receiving	FAIR	FAIR
Fax management	POOR	FAIR

480 on reader service card

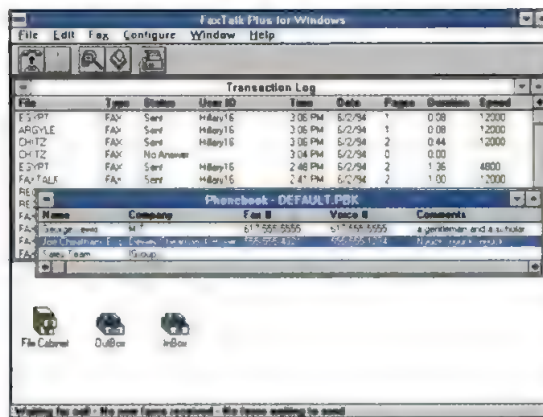
In general, Fax/PM's implementation of the Workplace Shell and its use of the object metaphor aren't very successful. You can fax by dragging and dropping a document icon on the fax/prINTER icon, for example, but the way the application is visually organized and represented is confusing. There's plenty of room for new and improved features in future versions, and the product's ease of use could also use a boost. Still, the package works pretty much as promised and will probably gain a following among OS/2 users.

Thought Communications Inc.

• FaxTalk Plus for Windows

BY HILLARY RETTIG

Thought Communications' FaxTalk Plus for Windows, Version 1.50B, subscribes to the no-frills philosophy of software design, offering few of the specialties that distinguish the market's biggest competitors from the rest. While this minimalist approach can be successful, FaxTalk Plus's \$69 price tag is only slightly lower than competing programs, and its basic toolset lacks some essential features. The



FaxTalk Plus offers straightforward faxing at a low cost—and with a minimal drain on system resources.

package is well-suited only for those users insistent upon a no-nonsense, lightweight program.

THE HEART OF THE PACKAGE

Sending faxes with this program is relatively speedy, and it demands only 2MB of RAM and 2MB of hard disk space. FaxTalk Plus's basic fax engine is robust, and installation is simple. The skimpy and poorly organized manual, however, is not very helpful.

FACT FILE

FaxTalk Plus for Windows, Version 1.50B

List price: \$69 **Requires:** 2MB RAM, 2MB hard disk space, fax modem, Microsoft Windows 3.0 or later. **In short:** FaxTalk Plus for Windows, Version 1.50B, eschews fancy cover pages and other bells and whistles for a minimalist approach to faxing; but, unlike most other fax packages, it supports both the T.434 and its own proprietary standard for binary-file transfers. It's a good choice for those who require DOS support and have limited hard disk space and memory resources; some users may find that other packages costing more also offer more value.

Thought Communications Inc., 1350 Ridder Park Dr., San Jose, CA 95131; 800-532-9825, 408-452-1010; fax, 408-452-1011.

SUITABILITY TO TASK

	Power	Ease of Use
Fax sending	FAIR	GOOD
Fax receiving	POOR	GOOD
Fax management	POOR	GOOD

481 on reader service card

This program can transmit binary files and poll other fax machines for fax and binary files. FaxTalk Plus supports the T.434 standard for file transfer, as well as its own proprietary format.

FaxTalk Plus also belongs to the minority of fax programs that automatically surrender COM ports when you switch to other telecommunications programs. In addition, a helpful Reset Modem menu option lets you reinitialize your modem easily.

A STRING AND A PRAYER

FaxTalk Plus is missing several extras, including OCR, annotation tools, scanner support, DDE, sophisticated file management, and more. While most

users may not miss some of these features (OCR and DDE, for example), they will probably miss others (annotation and file management).

To make matters worse, even the features that FaxTalk Plus does include are often too lightweight for serious faxing. Take the Phone Book: It records less information about your contacts than almost any other program reviewed and omits address information entirely. Furthermore, it lacks keywords and user-cus-

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tomizable fields, and its data import and export capabilities are limited to ASCII-format files.

Other features are similarly limited. While FaxTalk Plus lets you send faxes immediately or at a specified time, there is no hold or off-peak setting. Most of the full-featured packages (WinFax PRO, Version 4.0, for example) support these features. Finally, FaxTalk Plus's cover sheets are only minimally customizable: You can add a graphic image, such as a logo or signature file, but you can't add or merge fields or change the order or position of existing fields.

FaxTalk Plus's fax-reception capabilities are not much better. Because of the lack of annotation and file management tools, there is very little you can do with received faxes other than read, print, and save them. There's no automatic fax forwarding, for example; there are no thumbnail views and no manipulation of individual pages within faxes. Also, there are no graphical tools—other than vertical scroll bars—for viewing multiple-page faxes. Welcome tools would in-

clude buttons for GOTO, Next, and Previous commands.

DEVELOPING MUSCLE

Some of FaxTalk Plus's capabilities, however, are stronger. Its in-box and out-box, based on a row-and-column format, have some customization features. You can't change column names or orders, but you can alter size so that important information is given priority.

The program also includes a very helpful Transaction Log that lists all faxes sent and received. With just a couple of mouse clicks, you can sort the log by file name; file size; recipient name; phone number; call duration, date, and time; or other parameters. This can be a useful feature, especially for those users who need to track fax-related expenses. FaxTalk Plus also includes a useful archival file-cabinet module that lets you store frequently used attachment files.

Another strong point is DOS support: The program ships with a TSR that offers basic background send-and-receive services from DOS or Windows DOS boxes.

This feature worked well during our testing, although the TSR occupies a hefty 83K of RAM. (It can, however, be loaded high.)

If you happen to need what FaxTalk Plus offers, it might be the program for you, particularly if you work on a low-resource machine. It's probable, however, that many users will want a more powerful program, even at a somewhat higher price.

SofNet Inc.

 **EDITORS' CHOICE**
FaxWorks PRO for Windows

BY HILLARY RETTIG

SofNet's \$129 FaxWorks PRO 3.0 for Windows is a likable program that stands out from the pack, combining a strong feature set with an efficient, easy-to-use interface. In addition to all of the essential in-box and out-box features, it offers OCR, support for Twain and other scanners, and interoperability with several PIMs, including PackRat, Maximizer, and

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Fax Software



Products listed in alphabetical order

■ = YES □ = NO

	BitFax Professional for Windows	DataFax+	Eclipse FAX	ExpressFax+	Fax/PM	FaxTalk Plus for Windows	FaxWorks PRO for Windows	QModem Pro for Windows
List price	\$129.00	\$129.00	\$84.95	\$109.00	\$150.00	\$69.00	\$129.00	\$99.00
User interface	Windows	DOS, Windows	Windows	Windows	OS/2	Windows	Windows	Windows
Compatibility								
Fax transmission standards:								
Group 3	■	■	■	■	■	■	■	■
Group 4	■	■	□	□	□	□	□	■
Advanced Group 3 features:								
2-D encoding support	□	■	□	□	■	■	□	□
Binary file-transfer support	□	□	□	□	□	■	□	□
T.434 and Microsoft at Work	□	□	□	□	□	□	□	□
Error-correcting mode available with suitable hardware	□	■	□	□	■	■	□	■
Fax modem standards								
CAS	■	■	■	□	□	□	■	□
Class 1	■	■	■	■	■	■	■	■
Class 2	■	■	■	■	■	■	■	■
Class 2.0	□	■	□	□	■	■	■	□
Send-fax	■	■	□	■	□	■	□	■
High-speed transmissions supported:								
12,000 bps	■	■	■	■	■	■	■	■
14,400 bps	■	■	■	■	■	■	■	■
Supports DOS TSR	N/A ^①	■	N/A ^①	■	N/A ^①	N/A ^①	N/A ^①	N/A ^①
Composing								
Number of standard cover pages included	1	1	27	1	1	1	10	1
Includes text editor	■	■	■	□	□	■	■	■
Accesses another text editor	□	□	□	□	■	□	■	■
User can compose cover page	■	■	■	■	■	■	■	■
Full page	■	■	■	■	■	■	■	■
Half page	■	□	■	□	□	□	■	■
Imports text to cover page via Clipboard	■	■	■	■	N/A ^①	■	■	□
Supports bitmapped graphics	■	■	■	■	■	■	■	■
Signature	■	■	■	□	■	□	■	□
Logo or letterhead	■	■	■	■	■	■	■	■
Supports attachments	■	■	■	□	■	□	■	□
Allows distinctive second sheet	■	□	■	□	■	□	□	□
Spell-checker	□	□	□	□	□	□	□	□
Sending								
User can fax directly from application without changing print driver	■	■	□	□	□	□	■	□
Prints to fax software as a print driver	■	■	■	■	■	■	■	■
Sends screen capture	□	■	□	□	■	■	■	□
Sends selected portion of document	■	■	■	□	■	■	■	□
Allows preview before sending	■	■	■	□	■	■	■	□
Sends faxes in the background	■	■	■	■	■	■	■	■
Sends faxes at user-specified time	■	■	■	■	■	■	■	□
Shows in-progress status	■	■	■	■	■	■	■	■
User can send to multiple recipients	■	■	■	■	■	■	■	□
User can poll remote fax machines	□	□	□	□	■	■	□	□
User can resubmit failed jobs	■	■	■	■	■	■	■	■
Job restarts with first failed page	■	■	■	□	□	■	□	■
Phone Books								
Maximum number of phone books	Unlimited	255	Unlimited	99	1	Unlimited	Unlimited	Unlimited
Maximum number of entries per phone book	Unlimited	800	Unlimited	64,000	Unlimited	Unlimited	10,000	4,096
Imports and exports phone book data	■	■	■	□	■	■	■	□

N/A^①—Not applicable: The package's operating system does not support this feature

N/A^②—Not applicable: The product does not have this feature



\$69.95 \$129.00 \$179.99

Windows Windows Windows

Figure 1 illustrates the experimental design with three columns of stimuli. Each column contains 10 rows. The first 8 rows of each column show a pair of stimuli: a black square and a white square. The last 2 rows of each column show 'N/A' with a circled '1'.

1	101	1
☒	☒	☐
☐	☒	☒
☒	☒	☒
☐	☒	☐
☐	☒	☐
☐	☒	☐
☒	☒	☐
☐	☒	N/A ⁽²⁾
☒	☒	N/A ⁽²⁾
☐	☒	☐
☒	☐	☐
☐	☒	☐

Figure 1 shows a 3D volume represented by a grid of squares. The top row is labeled '1' through '12' from left to right. The left column is labeled '1' through '12' from top to bottom. The right column is labeled '1' through '12' from top to bottom. The bottom-left square is labeled 'N/A'.

Unlimited	Unlimited	Unlimited
Unlimited	Unlimited	1,000

The screenshot shows the 'File Tracker' application interface. The menu bar includes 'File', 'Log', 'File Cabinet', 'Scan', and 'Help'. The toolbar contains buttons for 'Open File', 'Band Log', 'Reverse Log', 'File Cabinet', 'View', 'Close', and a 'View' button. The main window title is 'File Tracker'. Below the title bar, there are buttons for 'Open File', 'Band Log', 'Reverse Log', 'File Cabinet', 'View', and 'Close'. The main area displays a table with the following columns: Date, Time, From, To, Sender, Status, Pages, and Duration. The table contains several entries, with some rows highlighted in blue. On the right side, there are buttons for 'View', 'Close', 'Open', 'Delete', 'Compress', 'Extractable', 'Print File', and 'Print Log'. At the bottom, there are fields for 'File Info', 'File Name', 'File Info', and 'File Info', and a 'Search' button.

Date	Time	From	To	Sender	Status	Pages	Duration
June 13 04	0:35am		718 717 4304	Completed	7	00:01:29	File
June 13 04	07:58am			Completed	7	00:00:00	File
June 13 04	10:55am			Completed	6	00:00:53	Send
June 13 04	05:10pm			Completed	1	00:00:49	File
June 06 04	8:51 pm	2176 700180	718 717 4304	Completed	6	00:00:57	Delete
June 05 04	10:17am			Completed	1	00:01:13	File
June 07 04	00:27pm		0717536237	Completed	4	00:04:27	Compress
June 07 04	05:36pm			Completed	2	00:02:46	File
June 07 04	05:16pm	000 5006		Completed	5	00:02:17	Extractable
June 07 04	10:54am	0005740275		Completed	0	00:02:07	File
June 07 04	07:17pm		718 717 4304	Completed	1	00:00:51	Print File
June 05 04	12:17pm			Completed	3	00:01:30	Print Log

File Info
 From: (0000 bps)
 File Name: 4 Unavailable...61487150 at
 File Info: La Roca 107 Group 1 02 100 bytes

Search
 Find
 Print
 Close

Power	Ease of Use
-------	-------------

482 controller service card

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► **S U M M A R Y O F F E A T U R E S**



Products listed in alphabetical order

■ = YES □ = NO

Phone Books (continued)

	BitFax Professional for Windows	DataFax+	Eclipse FAX	ExpressFax+	Fax/PM	FaxTalk Plus for Windows	FaxWorks PRO for Windows	QModem Pro for Windows
ASCII (comma-delimited)	■	■	■	N/A ²	■	■	■	N/A ²
.DBF	■	■	■	N/A ²	□	□	■	N/A ²
Other	ASCII (tab-delimited), BitFax, WinFax	WinFax	Btrieve, Phoenix Fax, WinFax	N/A ²	None	None	WinFax	N/A ²

Can read directly from PIMs	□	□	■	□	□	□	■	□
Maintains telephone and fax numbers	■	■	■	■	■	■	■	□
Allows notes	■	■	■	□	■	■	■	■
Allows permanent transmission groups	■	■	■	■	■	■	■	■
Allows selection of multiple recipients	■	■	■	■	■	■	■	■
Creates groups from phone book entries	■	■	■	■	■	■	■	■

Optical Character Recognition

Log includes visual thumbnail sketches	■	□	□	□	■	N/A ²	■	N/A ²
Reinverts pages transmitted upside down	■	■	■	■	■	N/A ²	■	N/A ²
Deskews crooked images	■	□	□	□	■	N/A ²	□	N/A ²
Handles legal-size pages	■	■	■	■	■	N/A ²	■	N/A ²
Incorporates dictionary into recognition process	■	■	■	■	□	N/A ²	□	N/A ²
Reads mixed files (graphics and text)	■	■	■	■	■	N/A ²	■	N/A ²
Reads foreign characters	■	■	■	■	■	N/A ²	■	N/A ²
Automatic page decompression	■	■	■	■	■	N/A ²	■	N/A ²
Retains page layout in applicable output formats	■	■	■	□	■	N/A ²	■	N/A ²
Retains character formatting	■	■	■	□	■	N/A ²	■	N/A ²
Multiple zoom levels	■	■	■	■	■	N/A ²	■	N/A ²
Text editor	□	■	■	□	□	N/A ²	□	N/A ²

Fax Management

Includes send log	■	■	■	■	■	□	■	□
Includes receive log	■	■	■	■	■	□	■	■
Image enhancement	■	□	□	□	■	□	■	□
Tool support	■	■	■	□	□	□	■	□
Annotation tools	■	■	■	N/A ²	N/A ²	N/A ²	■	N/A ²
Drawing tools	■	■	■	N/A ²	N/A ²	N/A ²	■	N/A ²
Text boxes	■	■	■	N/A ²	N/A ²	N/A ²	■	N/A ²
Erasing tools	■	■	■	N/A ²	N/A ²	N/A ²	■	N/A ²
Highlighting tools	□	■	□	N/A ²	N/A ²	N/A ²	■	N/A ²
Notifies user on receipt	■	■	■	□	■	■	■	■
User can store faxes with search index	□	■	■	□	■	■	■	□
User can attach notes to stored faxes	■	□	■	□	■	■	■	□
Compresses fax images for storage	■	■	■	□	■	□	■	□
Search capabilities	■	■	■	■	■	■	■	□
By date and time	■	■	□	■	■	■	■	N/A ²
By index	□	■	■	□	■	■	■	N/A ²
By sender	■	■	□	■	■	■	■	N/A ²
Automatic deletion by date	■	□	■ (sent faxes only)	□	■	□	■	□

Printing

Prints automatically on receipt	■	■	■	□	■	■	■	□
Prints selected page	■	■	■	■	■	■	■	□
Prints selected range of pages	■	■	■	■	■	■	■	■
Prints selected area	□	□	■	□	■	□	■	□
Prints in the background	□	■	■	□	■	■	■	■

Scanning Support

Supports scanners	■	■	■	□	□	□	■	□
Twain-compliant scanners	■	■	■	N/A ²	N/A ²	N/A ²	■	N/A ²
Scans document directly to fax	■	■	■	N/A ²	N/A ²	N/A ²	■	N/A ²

N/A¹—Not applicable: The package's operating system does not support this feature

N/A²—Not applicable: The product does not have this feature

ENDS



Quick Link GOLD WinFax PRO ZipComm

N/A②	■	■
N/A②	■	□
N/A②	Lotus Organizer	None
□	■	□
□	■	■
□	■	□
■	■	■
■	■	■
□	■	N/A②
■	■	N/A②
□	■	N/A②
■	■	N/A②
■	■	N/A②
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□	■	N/A②
□	■	N/A②
■	■	□
■	■	□
□	■	□
□	■	□
N/A②	■	N/A②
N/A②	■	N/A②
N/A②	■	N/A②
N/A②	■	N/A②
N/A②	■	N/A②
■	■	■
□	■	□
□	■	□
□	■	□
N/A②	■	N/A②
N/A②	■	N/A②
N/A②	■	N/A②
□	■	□
■	■	□
■	■	■
■	■	■
□	■	□
□	■	■
□	■	□
N/A②	■	N/A②
N/A②	■	N/A②

FaxWorks PRO's overall interface design reflects unusual attention to detail, exemplified by such deftly tuned features as the magnifiable cover-page thumbnail viewers and in the program's dynamic menu system, which changes depending on where you are in the program and which commands you are likely to need. FaxWorks PRO's superb on-line help system boasts some truly unusual features. With just one or two mouse clicks, for example, you can not only summon system and modem configuration information but also invoke Help windows (which shell out to Notepad) that automatically call up SYSTEM.INI, WIN.INI, FAXWORKS.INI, and other important files. FaxWorks PRO's help also offers Hot Screens, live replicas of dialog boxes: Click any part of the replica and up pops information about the command in question.

EFFICIENCY EXPERT

FaxWorks PRO will be especially cherished by efficiency junkies and people who send lots of faxes; SofNet has been ruthless in eliminating unnecessary keystrokes from core faxing activities. For example, the Send dialog box incorporates most of your phone-book fields and lets you fill in a new contact and send a fax in one step. Also, you can view contact information while faxing—a convenience if you want, say, to call and let the recipient know a fax is on the way.

Perhaps the best design element is the Fax Tracker feature, which functions essentially as a central clearing house for faxes: You can print, view, and compress them, as well as search your logs and manage your fax files—all with a minimum number of mouse clicks.

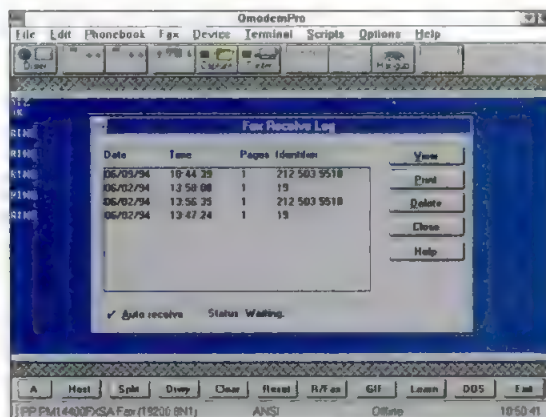
Unlike a number of the programs in this group, SofNet's FaxWorks PRO has no significant functional weaknesses. Its carefully crafted interface makes PC-based faxing about as quick and effortless as it can be, making FaxWorks PRO an excellent choice for all office-based users. (Inveterate road warriors may want the polling and forwarding features found in products such as WinFax PRO.)

Mustang Software Inc.

● QModemPro for Windows

BY STEVEN C.M. CHEN

QModemPro for Windows, Version 1.1, from Mustang Software, is a \$99 communications package that includes a fax module. It lacks some features that are standard in most fax packages, such as a log of outgoing faxes and a viewing facility, but these shortcomings may be an acceptable tradeoff for users who need only occasional faxing.



The Fax Receive Log is the only log file for faxes in QModemPro. You can launch the fax viewer, and print and delete faxes from here.

▶ FACT FILE

QModemPro for Windows, Version 1.1

List price: \$99 **Requires:** 4MB RAM, 5MB hard disk space, fax modem (Class 1 or Class 2), Microsoft Windows 3.1 or later **In short:** Can one communications package handle both data and faxes? Not QModemPro for Windows, Version 1.1. The latest release allows users to fax directly from Windows applications—a much-needed improvement; but for the most part, QModemPro offers only a handful of features that are available with other full-featured packages. This is a communications package that needs more time to mature—at least in terms of its faxing capabilities.

Mustang Software Inc., P.O. Box 2264, Bakersfield, CA 93303, 800-999-9619, 805-873-2500, fax, 805-873-2599

SUITABILITY TO TASK

	Power	Ease of Use
Fax sending	POOR	FAIR
Fax receiving	POOR	FAIR
Fax management	FAIR	FAIR

483 on reader service card

In the latest release, Mustang Software addresses the major weakness in Version 1.0: You can now fax directly from a Windows application. You can, as before, fax a document within QModemPro if the files are in text, .BMP, or .PCX format, but you can't fax a quick note unless it has been saved as a text file.

During testing, we encountered a compatibility problem between QModemPro

and our Intel CAS-based SatisFAXtion 400 Internal Modem. (Mustang representatives say the product is incompatible only with this modem model.) The faxing of a multipage document to another fax machine or modem was interrupted after only one page. When we switched to the Practical Peripherals fax modem, we experienced no problems receiving or sending faxes.

QModemPro doesn't have a hold feature for scheduling faxes for later delivery; the only send option you have is to send immediately. QModemPro keeps a log file for incoming (but not outgoing) faxes.

While QModemPro lets you design cover sheets, you are limited to using the program's built-in text editor. And to view your cover sheet, you'll have to fax it to someone else. You can include any of the dozen or so fax elements in the cover sheet, such as page count, date, time, recipient information entered in the Send Fax window, phone-book data, and graphics images.

THE RECEIVING END

To receive faxes, you have to set QModemPro manually to auto-receive mode or use the manual-receive option. Unfortunately, once you set QModemPro to auto-receive, you can't send faxes while waiting for incoming faxes.

If you need to keep track of all your outgoing faxes, you'd better keep pen and paper handy; there's no sent-fax log. The fax viewer offers fixed zoom options of 25 and 50 percent. You can print faxes and view them in thumbnail and full-page formats. We did, however, find an odd bug in the program: When we exited QModem's viewer, instead of returning to the program's terminal mode, we found ourselves out of the program altogether. This was particularly annoying when we needed to view multiple incoming faxes.

As a data communications tool, QModemPro has a standard set of features, including its own scripting language. If you have one of the Courier fax/data modems from U.S. Robotics, QModemPro can automatically recognize an incoming call as being from a fax machine or modem. If you have another fax modem that supports Call Selection, you may be able to access the autodetect feature by modifying the host mode script for that specific modem.

If you're looking primarily for a communications package, QModemPro's fax module is a bonus. Still, the problems and limitations we encountered with the fax module in the current release of the product make it difficult to recommend. In the light of other more powerful fax packages, your best bet with QModemPro is to consider it a package that is best for data communications only.

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Smith Micro Software

Quick Link GOLD

BY ANGELA HICKMAN

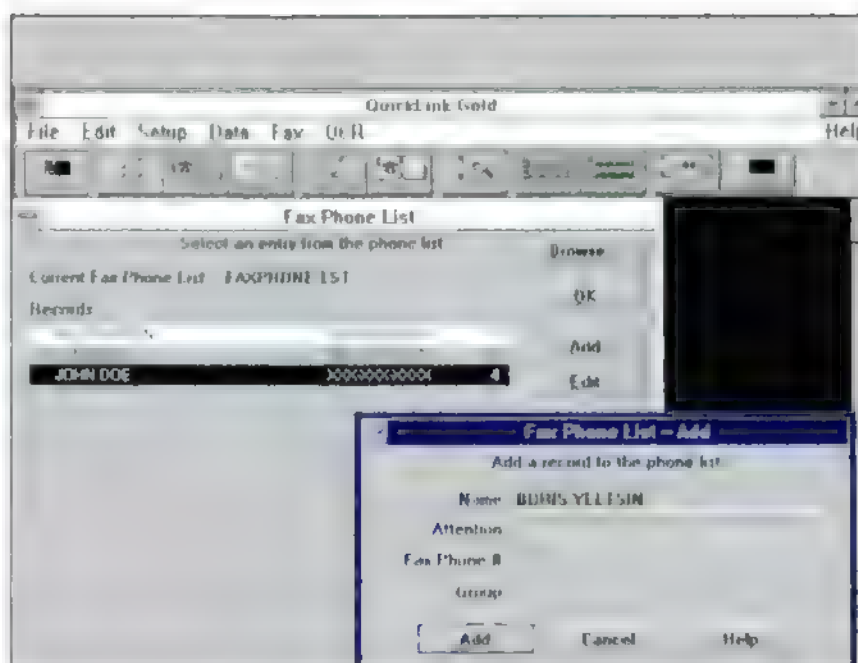
If you bought a fax modem any time over the past four years or so, you may be familiar with a licensed version of Smith Micro Software's Quick Link, a data-and-fax software package that has been bundled with lots of hardware products over the years. Smith Micro's commercial product, the \$69.95 Quick Link GOLD, Version 1.2.0, follows very much in the tradition of its licensed sibling, with a bare-bones approach to interface design and a spare feature set—designed for send-and-receive functionality and not much beyond. This approach may be suitable for users with light faxing needs.

Installing Quick Link is simple and painless. You can run the installation from either DOS or Windows, and it requires little or no effort beyond inserting disks. Quick Link's Auto Detect feature identifies the COM port in use and the kind of modem you are using (both Class 1 and Class 2 modems are supported). Quick Link's standard defaults will be suitable for most users, but they can be easily modified via the program's Setup menu.

MAKING BOOK

In keeping with the rest of the product's design, Quick Link's phone-book feature sticks pretty close to the basics. For example, although Quick Link supports an unlimited number of separate phone books, entries in those books contain only four fields: Company, Attention, Fax number, and Group number (the last of which holds only one ID character). Notes or Comments fields and similar amenities are absent. Further, you can't import records into a Quick Link phone book from your PIM or other database—not even in comma-delimited ASCII format.

Quick Link supports only one cover page—really only a bare transmission sheet. To set this up, you simply choose Cover Page Setup from the menu bar and fill in the information. As with the phone book, the cover page supports limited customization options and all-too-few fields for both sender and recipient data. Thankfully, the cover page does support a



Adding records to the Quick Link phone book is easy, but there are no fields for phone numbers and addresses—a real shortcoming.

notes field, which is useful when you want to send just a cover page and a short note, and .BMP, .DCX, .PCX, and TIFF graphics for logos. Quick Link does not support signature graphics on cover pages, the use of scanners, the Windows Clipboard, or binary-file transfer.

FAX MANAGEMENT

Quick Link's fax management capability is minimal. The program does not automatically notify you when you receive a fax, so you must periodically check the Receive Log for new faxes. Double-click-

ing on a log entry brings up the fax image; clicking the Info button accesses additional information such as Fax ID number, status indication, and time and date of receipt.

Quick Link offers neither thumbnail views nor annotation tools. The Send and Receive Logs do not support searching of any kind, nor does the product support sorting or automatic purging of faxes based on how long ago they were received.

Quick Link handles sending and receiving faxes satisfactorily. As with other products, you

fax from your Windows applications by printing to the Quick Link driver. Also like many other fax packages, Quick Link allows you to schedule fax transmissions (to take advantage of cheaper phone rates) and to fax to multiple recipients. You can print or "recognize" incoming faxes upon receipt.

While no upgrades to Quick Link are planned in the near future, Smith Micro is planning to release a new package, HotFax for Windows, by year's end (a DOS version of HotFax is already available). While Quick Link can do the basics and is relatively cheap compared with other data/fax packages, you'll probably be better served by any one of the other programs in this roundup—except MediaPoint's ZipComm. If you're a Smith Micro fan, wait for HotFax.

Delrina Corp.

EDITORS' CHOICE
WinFax PRO

BY HILLARY RETTIG

Delrina Corp.'s \$129 WinFax PRO, Version 4.0, is less an upgrade than a revolution. It reinvents not only its own category (fax software) but telecommunications software as a whole by providing an integrated front end to the three principal forms of digital communication: fax, e-mail, and BFT. What's more, it augments WinFax PRO's already-robust fax capabilities and adds a customizable interface.

Though our experience with WinFax PRO was not without minor glitches (including some nonreproducible general

FACT FILE

Quick Link GOLD, Version 1.2.0

List price: \$100. **Requires:** 1MB RAM, 2MB hard disk space, fax modem (Class 1 or Class 2), Microsoft Windows 3.0 or later. **In short:** Beyond send and receive functionality, the fax capabilities of Smith Micro's Quick Link GOLD, Version 1.2.0, are too limited to make it a serious contender—despite the program's added data communications module. While Quick Link offers OCR and fax scheduling, it lacks the ability to import records from PIMs and databases; to search, sort, and annotate faxes; and to design cover sheets. Although no upgrades to Quick Link are planned, Smith Micro will be releasing HotFax, a new Windows fax package, by year's end.

Smith Micro Software Inc., 51 Columbia, Aliso Viejo, CA 92656; 800-964-7674, fax, 714-362-2300.

SUITABILITY TO TASK

	Power	Ease of Use
Fax sending	FAIR	FAIR
Fax receiving	FAIR	FAIR
Fax management	POOR	FAIR

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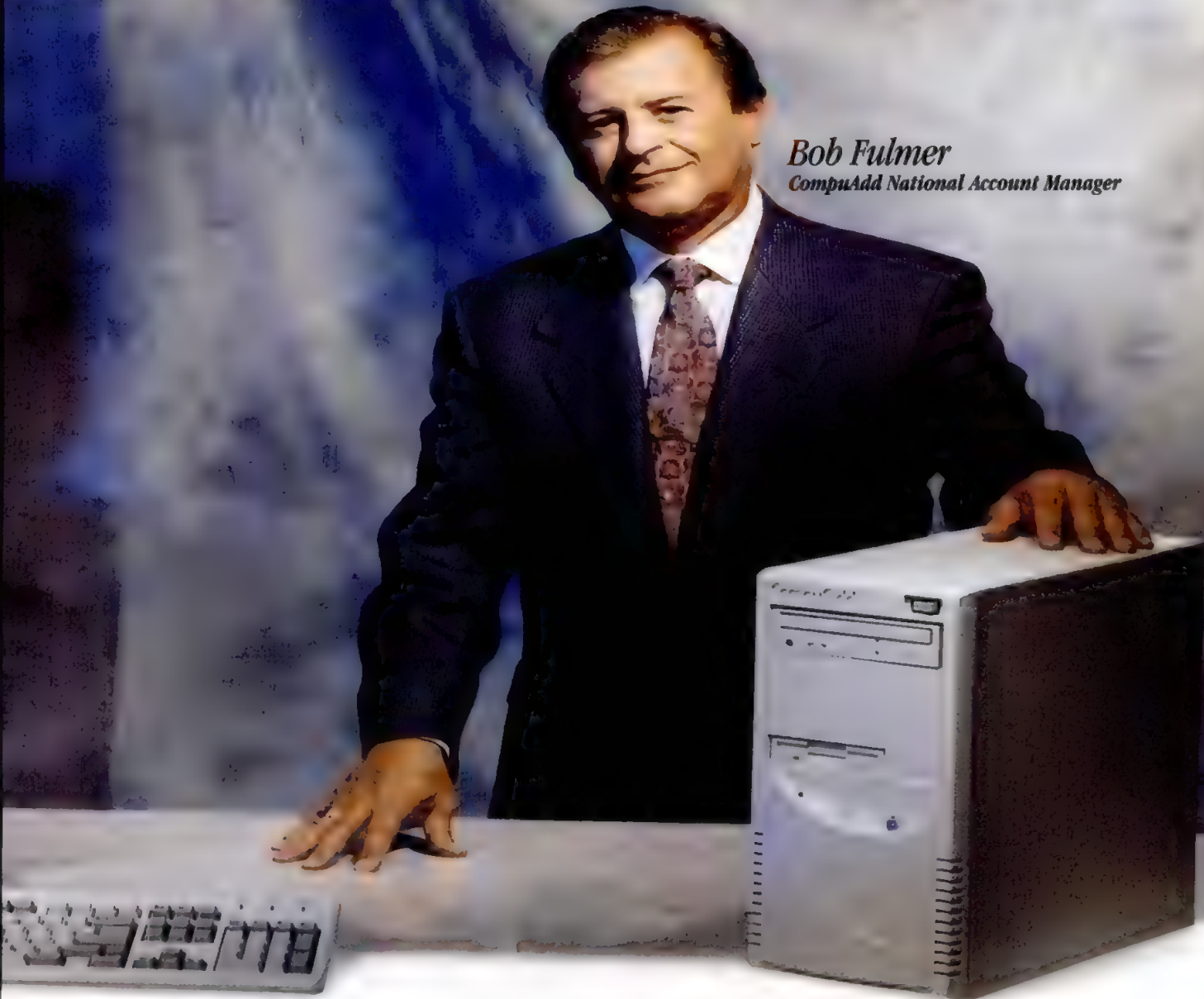


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Bob Fulmer
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protection faults), they weren't cause for consistent concern. Stability questions aside, those who do decide to go with WinFax PRO will be rewarded by what is arguably the most powerful program in our lineup. Feature for feature, it outstrips the competition—and does so at a reasonable price.

SENDING FORTH

The send module, for example, offers support for error-correcting mode (ECM), binary-file transfer, an off-peak time designation, a hold setting (for queueing faxes you want to send later), polling, and more. WinFax PRO broadcasts to groups, and you can configure the package to send the messages via fax or e-mail, depending on the recipient. Finally, WinFax PRO can convert data files on disk to fax format on the fly, without having to launch the application first. You can also create composite faxes from elements of two or more others.

Cover-page aficionados should love WinFax PRO's library of 101 graphical cover pages, as well as the sophisticated design module that lets you create and edit cover pages from text, graphical, and other components. The design module also includes a spell-checker—a helpful addition.

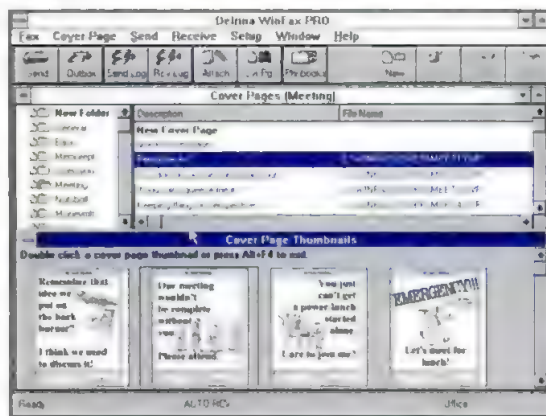
WinFax PRO's receive options are similarly powerful. You can view, print, or notify on receiving a fax, and you can also automatically forward received faxes to another phone number. The program's annotation tools really stand out: Beyond the familiar line, arrow, freehand, and text tools, WinFax PRO provides scalable text and graphics "stamps" so you can easily add frequently used labels, such as *Confidential*, or graphics images, such as signatures, to faxes. WinFax PRO also lets you rotate faxes in tiny increments, instead of limiting you to 90-degree jumps; this makes for improved OCR translation.

GOOD BOOK

WinFax PRO's phone book can record a great deal of information about your recipients. The phone book includes billing-related and notes fields (but, curiously,

not a Job Title field). Another WinFax PRO asset is that it allows you to search for any phone book information—in any field—by filling out a query form.

WinFax PRO bolsters its strengths by providing the most customizable user interface in its class. For example, the pack-



WinFax PRO comes with a library of more than 100 pre-designed fax cover pages and gives you a lot of flexibility in viewing and editing them.

age lets you customize button bars and views so that, say, logs can display either fax thumbnails or statistical information about faxes. In addition, the package allows you to add, delete, resize, or rearrange columns of information with only a couple of mouse clicks.

FACT FILE

WinFax PRO, Version 4.0

List price: \$129. **Requires:** 4MB RAM, 5.5MB hard disk space (10MB for full installation), fax modem, Microsoft Windows 3.1 or later. **In short:** WinFax PRO, Version 4.0, offers a robust feature set far outweighing that of most other fax packages. It includes superior document-security features, including password protection and file encryption; interoperability with ACT! and PackRat, and, for the first time ever, the ability to act as a front end for fax transmissions, e-mail, and binary-file transfers. But the program suffers from some rough edges and a somewhat inefficient design.

Delrina Corp., 6830 Via Del Oro, #240, San Jose, CA 95119, 800-268-6082, 408-363-2345, fax, 408-363-2340

SUITABILITY TO TASK

	Power	Ease of Use
Fax sending	GOOD	GOOD
Fax receiving	EXCELLENT	GOOD
Fax management	GOOD	GOOD

497 on reader service card

Further, WinFax PRO supports DDE and OLE, and it offers numerous phone-book import and export options. In another integration feature, the package uses phone books from popular personal information managers, including ACT! and PackRat.

Delrina also offers extensibility via two extra-cost services—Fax Mailbox and Fax Broadcast. Fax Mailbox provides a fax number that retrieves and stores your faxes until you can conveniently download them to your computer or nearby fax machine. Fax Broadcast lets you send faxes to large groups, via a Delrina service, without tying up your computer or phone line.

Finally, WinFax PRO offers particularly strong security features, including password protection and compliance with the Microsoft At Work file encryption and digital-signature standard. In addition, a feature called Send Secure allows you to send a fax only to a machine with the correct calling station identifier (CSID).

MANAGEMENT PROBLEMS

If WinFax PRO has an Achilles' heel, it is file management. Unlike other high-end programs, this one doesn't let you work with your faxes as DOS files, only as entries in a "file folder" document manager. (FaxWorks PRO 3.0 for Windows, for example, provides file name, size, and compression status for faxes: WinFax PRO offers none of that.) WinFax PRO doesn't even let you change your data directory, short of editing WIN.INI. Power users in particular will be affected by these limitations.

Another weakness: Because of WinFax PRO's slowness and the way its transmission dialog box appears on your screen, it is distressingly easy to interrupt a fax transmission inadvertently by typing into what you think is your foreground application (that is, the Windows application that you were running before you sent the fax—and that WinFax hasn't yet returned to foreground status).

In summary, if a robust features list is what you are looking for, you can't do better than Delrina's WinFax PRO. Users who are interested mainly in simple, straightforward faxing, however, and those who are gun-shy about trying soft-

ware that may not be quite ready for prime time, may want to consider the alternatives. In any case, Delrina deserves credit for producing what has the potential of being a landmark category-redefining product.

MediaPoint Inc.

• **ZipComm**

BY DEVAL SHAH

MediaPoint's ZipComm, Version 3.1, is a fax-and-data-communications product that misses the mark on several basic fax features. It provides a minimalist phone book, scheduler, and cover page, and no fax forwarding. Nor is there any OCR or scanner support. And at \$179.99, it is one of the priciest products in this roundup.

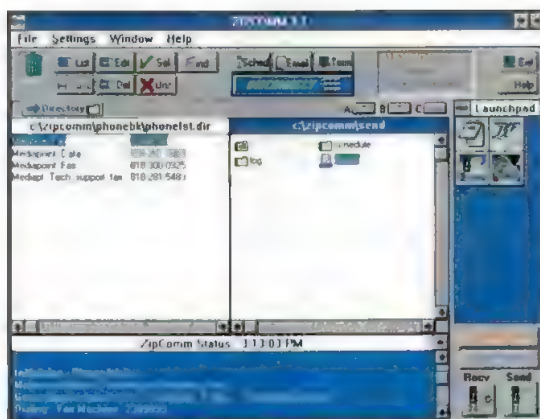
ZipComm does offer a couple of extras. One is an application launcher, LaunchPad, which lets you move to other programs from the ZipComm interface. Also, the package includes e-mail and remote-access capabilities, which can be used only among ZipComm users. Remote access gives users the option of binary-file transfers instead of faxes, which is an asset, because the latter can be time-consuming.

UNDER THE HOOD

Installing ZipComm is easy. You can, for example, use the program's Automatic Configuration Procedures routine, which automatically detects the COM port, modem, maximum transmission rate, and other details.

During testing, establishing a successful faxing link with this program was sometimes problematic. We were unable, for instance, to get two ZipComm systems to communicate with each other using matched pairs of modems. When we used two different modems, the program worked. Neither we nor the vendor ever satisfactorily explained this anomaly.

In ZipComm, you toggle between two screens: Send and Receive. Switching between them is effortless, but the package can be awkward in other ways: In some instances, there are no keyboard equivalents to mouse commands (such as using the arrow keys to move between phone entries). A mouse, therefore, is a must.



The Send screen, LaunchPad, phone book, and status bar in ZipComm help you keep your faxing universe compact and within easy reach.

BASIC FAX

ZipComm will not let you send a fax to a recipient that is not already in your fax phone book. So, for new recipients, you must go through the rather cumbersome process of entering a special edit mode, typing the name, and then returning to your task. Nor does this package offer a way to import database information into the phone book.

When you fax a document from an application, the document is printed to the ZipComm driver, which generates a file that is always named FAX.ZFX. Once the conversion process is com-

plete, the sender clicks the Send bar to transmit. You can send a fax to multiple recipients using ZipComm, but because the outgoing fax file, FAX.ZFX, is a single file, you cannot fax multiple documents to one recipient. Further, if you accidentally delete this file, the program will not let you send faxes from within your apps at all.

A couple of fax enhancements are missing or weak; for example, there are no hold or off-peak scheduling features. Further, when we used ZipComm's scheduler to send a file

at three different times, only the first instance was sent. MediaPoint representatives say they're working scheduler changes into an upgraded version.

ZipComm has no facility for making fancy cover pages. It offers only a basic fax-transmittal page that includes the sender's and receiver's names and fax numbers, time of fax, and number of pages to follow.

FAX MANAGEMENT

ZipComm receives faxes efficiently and unintrusively in the background, storing them in its Receive subdirectory and giving them ordered numerical file names. Faxes can be saved in .BMP and .PCX formats, but the program offers no filing or logging capabilities. You can view faxes simply by double-clicking their file icons, but the viewer provides only basic commands such as Fit Page to Screen and Reverse Image. The program offers no annotation tools.

You print faxes from within the viewer, but to do this you must first replace the ZipComm fax driver with the appropriate printer driver. You can't print portions of a page or scale images in order to fit several fax pages on a sheet. Also, you can't have faxes printed automatically upon receipt.

In summary, ZipComm fails to follow through on some of the essential points of faxing. Its scheduler, phone book, and fax viewer have several decided weaknesses. ZipComm will be effective only for users who send and receive faxes infrequently. □

FACT FILE

ZipComm, Version 3.1

List price: \$179.99. **Requires:** 4MB RAM, 3MB hard disk space, fax modem (Hayes-compatible Group 3 Class 2), mouse, Microsoft Windows 3.1 or later.

In short: MediPoint's ZipComm, Version 3.1, is a nonintimidating data and fax communications package for users who need to send and receive faxes infrequently. It supports only a moderate feature set and lacks the power of many other fax packages but surprisingly, it is more expensive than the norm. The package does provide some useful features, including easy installation and an application launcher.

MediaPoint Inc., P.O. Box 3039, Alhambra, CA 91803; 800-783-6355, 818-281-1599; fax, 818-300-0925

SUITABILITY TO TASK

	Power	Ease of Use
Fax sending	FAIR	GOOD
Fax receiving	FAIR	GOOD
Fax management	FAIR	FAIR

498 on reader service card

HIGH-SPEED MODEMS

Hurry Up & Wait

In search of that elusive data-transmission edge, we hurry to welcome one group of modem standard bearers even as we wait for the next group to push them aside.

By M. David Stone

They're at it again. The modem vendors, that is, working hard to redefine the last generation of high-speed modems as poky. If you want to be in the modem jet set, 14.4 kilobits per second (Kbps) just doesn't cut it any more—not when you can buy modems that boast speeds of 19.2 and 28.8 Kbps over standard phone lines. Granted, you won't find many other modems to connect to at these speeds yet. But that's the price you pay for being first on your block with this particular toy.

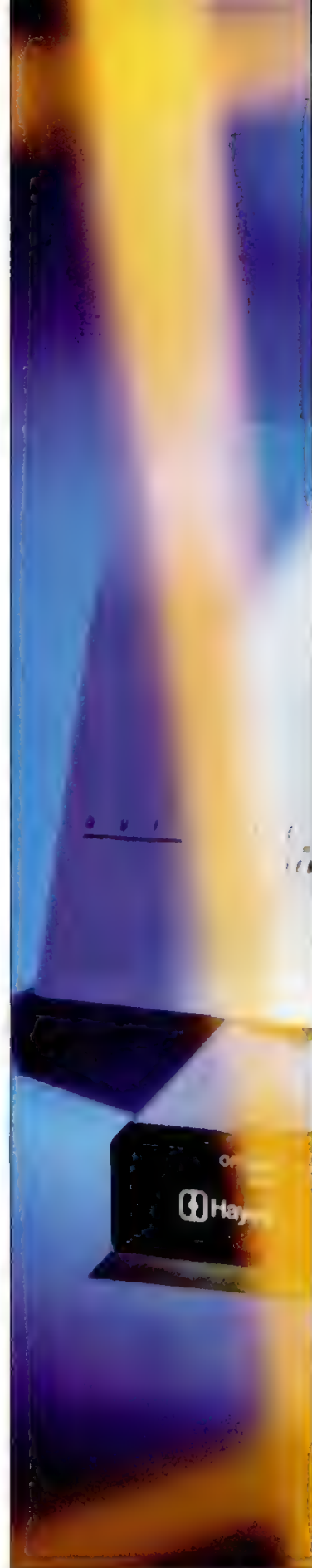
Here then is an interim report from the modem front line. "Interim" because the modems in this roundup have already been displaced. Late in the course of this story, the International Telecommunications Union (ITU) ratified the V.34 standard.

But you can think of these modems as a bridge between the recent past and the near future—between the 14.4-Kbps busi-

ness standard defined by the V.32bis protocol and the 28.8-Kbps standard that is V.34. The modems here offer extra speed for those who cannot wait until V.34 modems ship in volume. Given the arrival of V.34, the key question about the modems in our roundup is whether they are even worth considering. Surprisingly enough, the answer is a qualified yes.

In some situations, faster modems can be cost-effective even if you have to toss them out in a year. Suppose, for example, that you regularly move a lot of data between widely separated offices—New York, Miami, and San Francisco. Doubling your modem speed can cut your phone bills nearly in half and quickly pay for the modem, even if you never use it to communicate with anyone else.

This sort of scenario is the classic justification for modems that work only with other modems from the same manufacturer. It requires that you can specify the





modem on both sides of the link and that you can save more money on phone bills or increased productivity than you have to spend on the modems. This logic indeed applies to the modems we'll look at here. But with most of these modems, you can connect at high speed with modems from other manufacturers as well. And some offer more staying power than you would expect by promising upgrades to V.34. So you can have the speed now and the standard later.

MODEMS ON THE MOVE

To make it into this overview, a modem had to offer data communications above 14.4 Kbps and Group 3 fax support. In addition, it had to be external and able to connect through a standard serial port. Finally, it had to be shipping by May 1, 1994. We found 22 modems that met our requirements. Most were designed for the desktop, but we also found three "pocket" portables.

We chose not to look at modems that top out at 14.4 Kbps because they haven't changed much since we looked at them in our issue of June 29, 1993 ("Life in the Fast Lane"). One difference today is that 14.4-Kbps interoperability between modems from different manufacturers is more reliable; but that's just as true for the modems in this roundup as for modems with 14.4 Kbps as a top speed.

The only other change in V.32bis modems worth mentioning is that prices have dropped considerably. The street price today for a 14.4-Kbps external modem with fax capability starts at \$120 to \$170; internal versions are about \$20 less. Even PCMCIA versions are well below \$300.

Note that low price and reliable interoperability are two reasons you might want to stay with a 14.4-Kbps modem for now, or for some time even with V.34 a reality. You'll find more reasons in the sidebar "The Other Modem." For a different view, take a look at "A Ferrari on City Streets?" In fact, the modems in this roundup offer much the same features and functionality as the V.32bis modems we looked at last year—with the obvious exception of higher speed.

You should also bear in mind that all of the modems in this roundup offer a

High-Speed Modems

core set of modulation protocols that makes them compatible with older, slower modems. Included in the core set are two U.S. standards—Bell 103 (0-300 bps) and Bell 212 (1,200 bps)—as well as several worldwide standards: V.22bis (2,400 bps), V.32 (9,600 bps), and V.32bis (14.4 Kbps). Most modems include V.22, the 1,200-bps standard outside of the U.S.; some have other protocols, notably V.21, the 300-bps standard outside the U.S. (See “Standards: Treaties for Users.”)

These modems also offer V.42 error control—which uses LAP-M, or link access procedure (modems), as the preferred error-control mode—with a fall back to MNP 4. And all offer both V.42bis and MNP 5 data compression. Modems from Microcom, Supra Corp., and Zoom Telephonics include MNP 10 to improve reliability over a cellular phone link.

NONSTANDARD STANDARDS

As discussed earlier, most of the modems in this roundup can connect even at their highest speeds with modems from other

manufacturers. Rather than invent their own proprietary protocols, most of the 15 vendors included here chose to go with a shared standard—more precisely, one of two shared standards. As a result, we found only four high-speed modulation schemes in these modems. The first two are the shared standards; the third has both of the shared standards; and the last is a proprietary protocol.

The three ZyXEL modems are the only ones limited strictly to a proprietary protocol for speeds over 14.4 Kbps: The U-1496E offers 16.8 Kbps, and the other two models offer 19.2 Kbps. (The ZyXEL modems already included these proprietary protocols when the U-1496 Plus earned our Editors’ Choice in last year’s

modem overview.) If you want the widest possible interoperability now, the proprietary protocol is a strike against these modems. But the promised upgrade path to V.34 should soon make that irrelevant.

The U.S. Robotics modem also includes a proprietary protocol. More interesting is that it offers V.32-terbo and V.FC as well—the two shared standards mentioned above. All the remaining modems offer one or the other of these protocols, but not both. You’ll find V.32terbo in 5 of the other modems covered here and V.FC in 12.

V.32terbo is an extension of V.32bis; *terbo* is a pun that plays on *turbo* and *ter* (French for “the third time”), which would normally go after the V.32 if this were an official ITU protocol. V.32terbo was developed by a group of companies (most notably AT&T Microelectronics) as a way to get 16.8 Kbps and 19.2 Kbps out of modems that were slightly different from V.32bis modems in design. A glance at the Summary of Features will show that except for U.S. Robotics, all of the

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HIGHLIGHTS

High-Speed Modems

THE COMPANIES in this roundup responded to user pressure for ever faster modems even before the V.34 standard was ratified. What users have now is a good selection of V.FC modems, which they can upgrade to V.34, and V.32terbo modems, a few of which are very well priced.

UNTIL V.34 MODEMS are out in number, V.FC and V.32terbo modems could do the trick for you—if you must have more transmission speed right now. Overall, performance was good, and they have plenty of features. Some

include voice/data handling, and a few have advanced LCDs for better troubleshooting.

LIST PRICES—not to mention street prices—on all of these modems will probably have dropped by the time you read this in response to V.34’s ratification and the appearance of V.34-compliant modems.

YOU WILL WANT to pay attention to the internal PC-to-modem data transfer situation. Microcom builds in parallel-port support, and Boca bundles a

special I/O card to address it; all the others can use the Hayes ESP accelerator card to give you every last bit of throughput.

EARLY REVIEWS OF V.34 modems can be found in the First Looks section of this issue. Remember that it takes some time to shake all the bugs out of any new modem standard. If your V.32bis modems are doing the job without lots of problems, you may want to stay with that mature technology until it’s clear this new one is through basic training.

V.32terbo modems use an AT&T chip set—which, not incidentally, helps ensure compatibility.

V.FC is short for V.Fast Class, which in turn refers to V.Fast, the original name for V.34. V.FC was developed by Rockwell International Corp. in what amounts to an early interpretation of an unfinished version of V.34. As the name implies, V.FC is in the same class as V.Fast (now V.34) and has a top speed of 28.8 Kbps. Again except for the U.S. Robotics entry, all of the V.FC modems in this roundup use a Rockwell chip set; as before, this helps ensure compatibility.



- **Boca V.Fast Class External BocaModem**
- **GVC Maxtech 28.8Kbps Fax Modem**
- **Hayes Optima 288 V.FC + FAX**
- **Practical Peripherals PC288MT V.FC**

You buy a faster modem because you want to move as much data as possible as fast as possible. Relative price is less of an issue than that the modem works consistently and works fast! Thus, our focus for Editors' Choice was on performance first (partly related to price) and then on particular features.

Since the V.34 standard was ratified at the 11th hour during this review, designating EC honors became truly interesting. It's not yet clear how soon V.34 units will be out in numbers, so these are still good choices. Although we've listed the designees in alphabetical order above, our recommendations are in no particular order. This entire product set is rich in trade-offs.

The Hayes Optima 288's handling of compressible files, particularly in bidirectional transmission of data, was exceptional. If you're looking to squeeze the most data through the line, Hayes will help you do it. And you have the strength of the Hayes reputation to bank on. Interestingly, Hayes has not tampered with the traditional look of its modem.

GVC's Maxtech turned in an excellent performance as well, also doing particularly well on bidirectional transfers. Its \$199 list price is fairly amazing for V.FC performance, upgradability, and a good set of standard

software and features.

The V.FC BocaModem appealed to us for its good performance and pricing and because it ships with a 16550 UART card to solve the high-speed bottleneck problem. Both of the Microcom modems also address this difficulty by adding a parallel-port interface. In fact, Microcom's Travel-Porte FAST is the only solution of the three for notebook users who have a slow UART.

All of Practical Peripherals' modems made a good showing in our roundup because of their many features and good pricing. The four were huddled in the right corner of our price/performance chart. You can pick and choose between features and price with Practical Peripherals; the PC288MT simply hit the best combination of the four. However, we also give a special nod to the PC288LCD V.FC for its tower design, 3-line LCD, and other indicators. This is an excellent user interface for a modem—the friendliest we've seen at any speed.

BUT SHOULD YOU BUY ONE, OR TWO, OR . . .

Given that V.32terbo and V.FC are both de facto standards, you might think that either kind of modem is a reasonable choice. One look at the prices, however, should give you second thoughts. List prices for the V.FC modems range from \$199 to \$595. List prices for V.32terbo modems range from \$199 to \$695.

Two conclusions jump out from these numbers. First, with list prices starting at \$199, street prices will be only slightly more than for comparable V.32bis modems; this means you'll pay only a small premium for the extra speed. Second, given that the two price ranges are essentially identical, V.FC offers a far better ratio of price to performance—if both kinds of modems deliver the performance they promise. They do.

ZD Labs ran these modems through its standard battery of tests to determine throughput with different kinds of files, different kinds of applications, and different telephone network conditions. The results show a clear difference between the two categories of modems. (See the Performance Tests.)

For example, the Telephone Network Simulation test results show the throughput you can expect from each modem, on average, for 96 percent of all line connections in the U.S. and Canadian public phone networks. Not only did all of the V.FC modems achieve significantly better throughput than any of the V.32terbo modems, but there is little difference between modems within each group.

Complicating matters is that on some tests, the best of the V.32terbo modems

did better than some V.FC modems. For example, the two Zypcom modems were indistinguishable from the V.FC modems with the Highly Compressible Graphics File test; this is because their large dictionary and fast processor give them an advantage in compressing files. (A large dictionary means the modem can recognize a greater number of redundant data strings.) But on most tests, even the worst of the V.FC modems outperformed the best of the V.32terbo modems.

No one modem is best for all purposes, but the Hayes Optima 288 V.FC + FAX came closest; it turned in the top score, or close to it, on almost every test. More generally, here are some rules of thumb that can help you find a modem to match your needs.

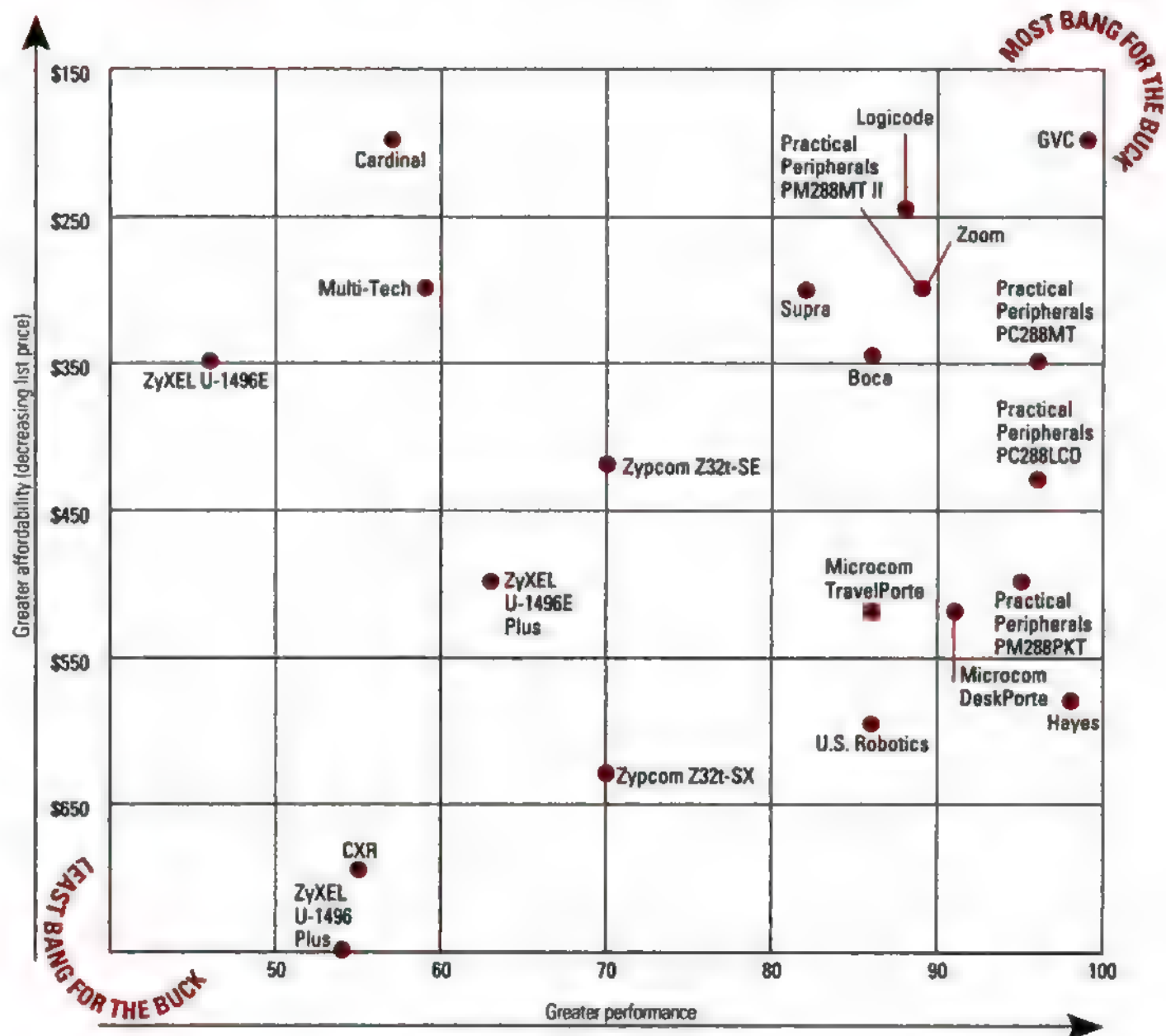
If you spend most of your on-line time moving uncompressed data in one direction—as with database systems such as Dialog—pay particular attention to the one-way throughput results. The V.FC

■ Price/Performance Index: High-Speed Modems

Not surprisingly, most of the V.FC modems ended up on the better side of our chart. They had to be well priced to compete with the anticipated arrival of V.34-standard modems, and they simply had to offer good performance.

We plotted price against performance only, not performance and features, because we felt speed was the overriding purchase decision here. Moreover, the great additional features some of these units offer were not widely comparable in a statistical way. It's best to look here *and* consult the Summary of Features table and individual reviews.

Under performance, we took into account the modem's performance on unidirectional and bidirectional transfer tests, as well as our Telephone Network Simulation test. That test indicates how well a modem can handle line interference and still transmit at high speeds. The E-Tech modem is not included in this chart, because it could not complete our tests.



modems did well on most of these tests.

If you use a remote-control program, a LAN-to-LAN bridge, or other application that depends on two-way communications, pay special attention to the bidirectional throughput tests. The two modems that scored best on these are GVC Technologies' Maxtech 28.8Kbps Fax Modem and the Hayes Optima; U.S. Robotics' Courier V.34 Ready Fax with V.FC and V.32bis came in close behind.

If you spend much time transferring compressed files from BBSs or the like, pay special attention to the Noncom-

pressible File test. A good score here means fast, inexpensive downloads. Most V.FC modems scored well on this test.

BEYOND PERFORMANCE

Performance is not the only thing that matters in choosing a modem or in deciding to wait. One feature you'll certainly want to give extra points for is upgradability to V.34; this is present in all of the V.FC and ZyXEL modems, but only in the Zypcom Z32t-SX among the V.32terbo modems.

Another feature to look for is an al-

phanumeric LCD display, which you'll find on the ZyXEL U-1496 Plus, the Practical Peripherals PC288LCD V.FC, the SupraFAXModem 288, and the Microcom DeskPorte FAST. The number of items you need to track for high-speed communications—from speed to data compression—is simply too much to handle conveniently with status lights. A well-designed LCD can show you the information you need in English or with recognizable abbreviations. If you can't get an LCD, you're still far better off with status lights than without them. Keep this in mind particularly for portable modems.

Also remember that when you're jetting along at 28.8 Kbps, with a data compression tail wind boosting potential throughput to 115.2 Kbps or more, the modem is no longer the bottleneck for communications. The bottleneck can be your serial port. Modem vendors offer different solutions for this problem that boost your DTE (data terminal equipment) rate—the communication speed between your modem and computer.

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• The Other Modem

The temptation is strong to buy a top-of-the-line modem. But new and different may not be better; 14.4-Kbps modems still hold some advantages (for a while).

By Stephen Satchell

Is the grass always greener? Remember that we're talking *modems* that must deal with *telephone lines*.

For starters: A brand-new, state-of-the-art V.34 modem does nothing to improve the speed of information transfer by itself. To get V.34's benefits, you must have two V.34 modems—one at each end of the connection. Think about how you'll use a new modem and whether its full potential will be called upon. Although the V.34 products announced in July offer downward compatibility to V.32bis modems, that's no reason to spend the extra money now.

Consider the on-line information services and the networks serving them. They are already overtaxed trying to support V.32 and V.32bis. V.32terbo, V.FC, and V.34 just add a greater processing burden to these systems, which are built around large multiuser mainframes that handle as many as 100 users each. CompuServe, for example, is still getting its feet wet with 14.4-Kbps service.

But even if your service offers access better than 14.4 Kbps, there's no guarantee that the service will be able to make use of all of that digital bandwidth. All the bits in the world aren't going to speed up a database query on Dialog.

Some services, again such as CompuServe, charge a premium for high-speed access; you pay whether or not there is data transferred by the channel. Access can end up costing you more with a top-speed modem than with a slower one.

DON'T LOWER YOUR STANDARDS

It takes time for vendors to discover all the incompatibilities and glitches in a

product like a modem. Designing modems is an art, not a science. (Some say it's a black art.) There are few instances where there is a "right way" to do things. And of course the newer the standard, the less likely it is that products conforming to it will be fully debugged.

All of the above—14.4-Kbps modem modulations are relatively new. So you are likely to run into performance problems using them—some minor, some major, and all unpredictable. In a mission-critical application, using a pioneering technology increases business risk.

Proprietary standards are another issue altogether. V.32terbo and V.FC are modulation methods promoted by a particular company—AT&T in the first case and Rockwell International in the second. With the sole exception of Telebit's PEP protocol, every proprietary modem protocol has fallen by the marketing wayside. And the list is a long one, including: Racal-Datcom 1200-bps, Hayes Smartmodem 9600, U.S. Robotics' HST, and V.29.

In some cases, your requirements will make the call for you. Some situations just won't work with high-speed modems. Retail-store credit-card authorization terminals, for example, use 300-bps modems. The amount of data transferred is small, the separate connection per transaction means that modem handshaking time becomes significant, and 300-bps modem trans-

mission is almost bullet-proof.

Interactive e-mail access is best done at slower speeds. You can type and read only so fast, and even the slowest modem can transfer data more quickly than the world's fastest typist. So when you are selecting a modem—especially if you're thinking about abandoning one that's been working out just fine—be realistic about how much speed you really need.

THAT UNPREDICTABLE TELEPHONE COMPANY
In modem communications, the largest component (and the least predictable)

is the telephone system. How a modem works today on the switched network (the technical term for the telephone system) is no indicator of how the modem will work tomorrow. This cuts both ways: A modem that runs slow today could start running at its rated speed

*Depending on
what services and
applications you use
your modem for, you
might want to delay
your move to 28.8.*

tomorrow, and today's greyhound could become tomorrow's three-toed sloth.

To be sure, the telephone system we have today is a big improvement over the network of 10 years ago. Indeed, the conversion of speech to digital transmission is as important and as revolutionary to telephony as compact disks are to the recording industry. This constant improvement, in fact, caused the cost of V.32 modems to drop dramatically in 1987 and made V.34/V.FC possible.

Perversely, the continued evolution of the telephone system into a foundation for the much-touted Infobahn has given rise to modifications that are murder to high-speed modem use. This evolution is changing the pair of wires between your phone and the central

office to a pair of wires from your phone to a neighborhood concentrator, with a high-speed digital channel connecting the concentrator to the central office. What happens, though, is that the telephone company runs out of slots on the digital channel and needs to add a small number of lines in the same amount of space.

The answer to the telephone company's problem has many labels: ADPCM (Adaptive Differential Pulse Code Modulation), digital speech compression, pair gain, or trunk doubling. Whatever the name, the technique takes the 64-Kbps bitstream containing speech (and modem) information and squeezes it down to a lower rate.

This allows more channels of speech to be carried on the same digital system. A T1 digital carrier system, for example, can carry 24 connections. Using ADPCM (specifically the ITU G.721 algorithm), the T1 system can carry 48 connections with almost no noticeable difference—to humans.

Modems, however, notice the change right away. The human ear is insensitive to phase distortion, but modems use phase distortion to convey data. Signals heard by the modem through an ADPCM channel have the same problem you would have if you tried to read a page of print where the press had put on too much ink. With excess ink, the shapes of the letters blend together and you can't recognize anything.

Just as bigger letters alleviate the print problem, modems slow down (or fall back) to increase the spacing in the signal constellation so that it's easier to winnow out the correct data. To measure just how much ADPCM can affect modems, Satchell Evaluations conducted some preliminary tests.

The modems tested were the Cardinal MVP144E, the U.S. Robotics Courier V.32terbo with ASL, and the Microcom DeskPorte FAST. We tested throughput and call-connect reliability (described in the latest draft of TIA TSB-38) using the rare North

American connection 25A from TIA TSB-37A and all seven combinations of subscriber loops from the same document. The throughput tests were run only once, so the results from these tests serve as guidelines only.

The Cardinal MVP144E, a V.32bis modem using the AT&T chip set, ran at 50 to 70 percent of its maximum throughput over the ADPCM line versus the throughput over a best-case connection. The effect of ADPCM is evident from the data transfer rates reported by the modem: 9,600, 7,200, and 4,800 bps over the ADPCM connections and 14.4 Kbps over the non-ADPCM channels.

The U.S. Robotics Courier V.32terbo modem, using U.S. Robotics signal converter code running on a TI TMS340 DSP chip, transferred data at less than 40 percent of its best-case connection rate—if it ever got connected. The connect report was useless, as the modem reported the same 21.6-Kbps rate for every call.

The Microcom DeskPorte FAST, based on Rockwell's V.FC chip set, was the most affected by the presence of ADPCM: Throughput dropped 10 to 30 percent. The most telling symptom was that you couldn't get a connection without transmission errors when error control was turned off.

These results surprised us. We didn't expect to see modem performance so drastically affected, nor so dramatic a difference from modem to modem. In fairness to the vendors, the ADPCM test is optional in TSB-37A, and the incidence of ADPCM in the United States and Canada is a recent development.

Anyone buying a modem today needs to weigh the speed benefits of a really fast modem against the interoperability and reliability of a V.32bis modem. Anyone considering an upgrade should look to see if it is needed immediately. Don't be shy if you can show a benefit now; but if you can wait until December or January, you will almost certainly get a more reliable modem. □

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They may bundle an I/O card with a 16550 UART chip, recommend that you buy a separate chip, or (as in Microcom's modems) redirect communications to the parallel port. For more on this issue, take a look at "The Art of UART."

A feature you may wish to wait for is voice capability. This actually covers two unrelated categories: voice with data and voice processing. Voice with data allows you to switch easily between voice and data on a single phone line or to use both those modes simultaneously during a single call. Expect to see the switching version first. (See "Modems Find Their Voice.") Voice

processing will let you use your modem for voice mail and related applications.

Momentum is building to add voice features to modems. ZyXEL already includes voice-processing features in its modems, and Rockwell says it will build voice processing into V.34 chip sets.

Finally, don't forget the basics. Check the Summary of Features for warranty and support information. And don't ignore bundled software: A cheaper modem without software—or without the software you want—may end up costing more than a higher-priced modem with all the software you need.

Boca Research Inc.



EDITORS' CHOICE

V.Fast Class External BocaModem

If making the modem *look* fast was one of Boca Research's intentions, it succeeded. Fortunately, the V.Fast Class External BocaModem is every bit as fast as it looks. The V.FC BocaModem is a good choice for those who want 28.8-Kbps power now and an upgrade to V.34 later, since Boca offers a straightforward upgrade solution to the ITU's newly ratified standard.

Standards: *Treaties for Users*

By Stephen Satchell

Standards are agreements between computer equipment vendors and users. It's that simple. Without standards, a communications board from DCA wouldn't work in a Packard Bell 486/33, and a Hayes Accura 144 wouldn't be able to communicate with a Motorola UDS V.3229. The Intel-based PC market is huge thanks to standards.

A standard is an enumeration of existing market practices that all participants in creating the standard agree is most appropriate. Sometimes an existing product is taken in toto: Witness the adoption by the American National Standards Institute (ANSI) of many of the physical and electrical practices defined by IBM for storage media and interconnection.

Sometimes practices from several vendors are melded into one, as with the C language standard. The last couple of modem modulation standards—most notably V.34—took different ideas from inventions not yet deployed to create a standard that uses telephone channels to their limits.

One standard seemingly created from whole cloth is V.42 error control. It was taken not from Microcom Network Protocol (MNP), which was the predominant modem-to-modem error-control protocol at the time, but from the X.25 suite of protocols. It took link

access procedure (balanced), or LAP-B, and tailored it for modem use. Hayes was the first to market it; nearly every asynchronous modem sold today has it.

DELEGATION BEGETS DELEGATION

The process of establishing a standard differs from organization to organization. The general idea is that vendors and users get together and develop the text in a committee. Many committees delegate portions of the task to subcommittees, which may repeat the delegation process until tasks are small enough for a group to complete.

Once a committee agrees on the contents of a proposed standard, copies in the form of a ballot are mailed to a number of people identified by the sponsoring organization as interested parties. The responding parties then mail (or sometimes fax) back their ballot response. The committee tallies the results and resolves any disputes. Disputes arise when a respondent votes no or feels an issue needs further consideration.

There may then be a final round of voting. This is true of the International Telecommunications Union (ITU), a division of the United Nations, in which two-thirds of the member countries must vote yes in order for a recommendation to be accepted and distributed.

THE PLAYERS (YOU'RE INCLUDED)

In the United States, all national standards are created under the auspices of ANSI. ANSI recognizes several groups as "standards providers": the Institute of Electrical and Electronic Engineers (IEEE), the Electronics Industries Association (EIA), the Telecommunications Industry Association (TIA), and others. ANSI reviews all such organizations.

Setting standards is not cheap. Individuals can spend upward of \$10,000 per year in fees and expenses to participate in the effort. Many companies spend far more; still, the savings in engineering, production, and sale of equipment is many times greater than the cost. Standards are good investments.

You and your company can participate by urging user groups to collect information about standards in progress and by providing a platform for your views to be heard. Many online services feature discussions of standards under review; often, standards committee members there will take your ideas back to the table.

If your company has invested heavily in a particular technology, it would do you well to spend the money to join and participate. Standards promote open competition, which leads to higher quality, lower prices, and fewer headaches. □

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High-Speed Modems

The modem's low-profile black-alloy case sports eight LEDs that suggest the V.FC BocaModem should also be put through wind-tunnel tests. Its performance was in keeping with similar 28.8-Kbps modems we looked at.

Included in the \$345 package is an 8-bit I/O card that carries a 16550 UART-driven enhanced serial port. This is a practical requirement for realizing the full speed of an external V.FC modem. Boca also bundles Windows and DOS versions of COMit LITE 1.17b, a communications software program, and FaxWorks 3.0 fax software.

To upgrade the V.FC BocaModem to V.34, owners should send the modem in with a \$49 check to Boca Research. Boca plans to replace the entire PC board and ship the modem back to the user in 2 to 5 days. The distinctive black box is left untouched.

Boca Research recently acquired The Complete PC and, along with it, The Complete PC Turbo Modem V.Fast. The Complete PC modems are not distributed through conventional retail stores, but through large warehouse stores or by direct mail; they also list at \$345 each. The Boca and Complete PC modems share similar hardware.

Boca's V.Fast Class External modem includes eight LEDs and an upgrade path to the forthcoming V.34 standard. Its performance was on a par with its V.FC competitors, and the price is good considering the included UART serial-port board.—

Jae Yang

► **V.Fast Class External BocaModem.** List price: \$345 (includes 16C550 UART serial card). Boca Research Inc., 6413 Congress Ave., Boca Raton, FL 33487; 407-997-6227; fax, 407-997-0918.

Circle 450 on reader service card

Cardinal Technologies Inc.

• Cardinal MVP192E

At \$199, Cardinal Technologies' MVP192E is a good value. Prices are plummeting on this and other V.32terbo modems because of the speedier V.FC proprietary standard. But don't expect an upgrade path—Cardinal has no plans to move this modem to V.34.

The manual has a good installation section that explains the eight front-panel

LEDs and hook-up scheme. The advanced user section does a good job of describing the various protocols and the command set. With its discussion of the problems involving slow serial ports, the manual should help users out of trouble.

Better known for its budget PC sound and video accelerator cards, Cardinal also

*Boca Research's
modem includes an
8-bit I/O card that
carries a 16550
UART-driven
enhanced serial port.*

builds an entire line of modems. The company's expertise with PC cards is demonstrated by the Cardinal MVP192E's streamlined interior. The AT&T chip set and a few other components are surface-mounted on a very clean board design. You shouldn't need to use the limited lifetime warranty; it's hard to imagine that much can go wrong.

Two software packages are included. FaxWorks LITE for Windows is a minimalist design suited for basic home use. COMit LITE for Windows is a more complete communications package that supports scripts and batch dialing and has a helpful manual for installation and troubleshooting.—Tom Kreyche

► **Cardinal MVP192E.** List price: \$199. Cardinal Technologies Inc., 1827 Freedom Road, Lancaster, PA 17601; 717-293-3000; fax, 717-293-3055.

Circle 457 on reader service card

CXR (Anderson Jacobson)

• CXR 1945-FXD1

One of the largest modems in this roundup—nearly a foot long—the CXR 1945-FXD1 V.32terbo modem does not seem intended for the desktop user. CXR's modems are meant for the back room, leased-line rack-mounted environments associated with centralized data communications tasks. Even the list price—\$695—says back-room purchase.

In its documentation, CXR devoted a full chapter to explaining its modem's leased-line operations, which implement Unattended Automatic Dial Backup (UADBU). UADBU dials up a regular switched circuit if the leased line fails.

The CXR 1945-FXD1 performed poorly on file-transfer tests. Moreover, the least-compressible executable files had the longest transfer times, indicating that the modem would not work well for remote control or remote-node LAN access. The modem refused to adjust its baud rate above 38.4 Kbps automatically and required special AT commands—AT@D13, AT@A0, and AT&W—to test at our preferred DTE speed of 115.2 Kbps.

If you can accept its comparative performance drawbacks, the CXR 1945-FXD1 does offer some good features for the MIS buyer. (As of this writing, Anderson Jacobson plans to have a whole line of home-use modems on the market by the end of summer.)—Gary Gunnerson

► **CXR 1945-FXD1.** List price: \$695. CXR (Anderson Jacobson), 2040 Fortune Dr., Suite 102, San Jose, CA 95131; 800-537-5762, 408-435-8520; fax, 408-435-1276.

Circle 465 on reader service card

E-Tech Research Inc.

• P192MX Bullet Modem

If unusual shapes interest you, check out E-Tech Research's V.32terbo P192MX Bullet Modem. This UFO-like battery-powered portable has a data transfer rate of 19.2 Kbps and 14.4-Kbps fax capability, but it was not able to perform properly on our performance test-bed.

As we went to press, E-Tech engineers continued trying to determine the problem. To ensure that the tested units were not defective, we connected them to our alternate I/O test-bed and transferred a few files. Under those conditions they seemed to work well enough, but we cannot provide definitive information about their data performance under our more rigorous standard testing.

This modem otherwise provides good features. The four LEDs offer a balance of useful information and power saving. The unit draws under 1 watt when in use and less than 350 milliwatts in standby mode. The result is a battery life of about 2 hours of continuous operation.

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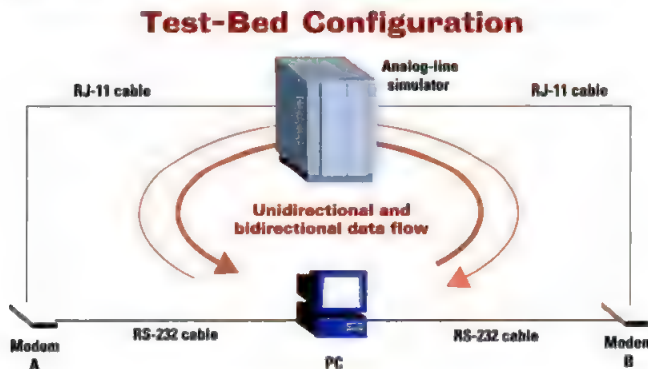
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For the most part, we found like performance within each of the two groups of modems here, V.FC and V.32terbo. As expected, our testing showed that the V.FC modems, which operate at a higher speed, exhibited higher throughput than the V.32terbo units.

What the Numbers Mean

In assessing these modems, which support data-transfer rates above 14.4 Kbps, we tested throughput with various file types. The results demonstrated that a modem's performance depends largely on its design and the manufacturer's integration of its components. A modem, not unlike a small computer, consists of a signal converter, a controller, and the firmware necessary to make them work together.

Another concern modem designers (and users) have been faced with is the degradation of data signals over the public switched telephone network (PSTN). The Telephone Network Simulation test illustrates that as the PSTN evolves



from an analog transmission system to a digital system, modem manufacturers are able to push speeds to 19.2 Kbps and 28.8 Kbps with fewer retransmissions and less data loss.

COMPRESSED OR NONCOMPRESSED

Our tests of various data types gauged the file-transfer capacities of the modems. With our *highly compressible graphics file*, we were able to determine the capability and efficiency of the modem's compression algorithm. For most of the 28.8-Kbps modems, the limiting factor was the computer's data terminal equipment (DTE) rate of 115.2 Kbps. Note that several of the 28.8-Kbps V.FC modems, such as those from Microcom, support a higher DTE rate, but they require proprietary interfaces. In adherence to standard industry testing procedures, we tested at a maximum rate of 115.2 Kbps.

As E-Tech Research's P192MX Bullet Modem was unable to perform our tests at 115.2 Kbps, no results are reported for

this product. E-Tech continued to investigate the problem as we went to press; the company may have a solution worked out by the time you read this.

Another significant factor is the modem's *data compression dictionary*. A data compression dictionary dynamically stores common bit patterns and represents them as smaller symbols. Generally a larger dictionary helps compression but uses valuable RAM.

The *moderately compressible text file* tested each modem's ability to handle a typical word processing file. In most cases the modem's performance was comparable with that of others built on the same standard—V.FC or V.32terbo. The one exception was the Hayes Optima 288 V.FC + FAX, with a large, 8,192-byte dictionary that improved compression and resulted in higher throughput.

For transfers of the *slightly compressible executable file*, effective throughput decreases with a larger dictionary. The larger a modem's dictionary, the worse the compression the modem will achieve with this file. Thus, the Hayes modem, with its large dictionary, did not perform as well when transferring the executable file.

The *noncompressible file* is the type of file that might be downloaded from a BBS. V.42bis compression is effectively disabled, and little processing power is required (line impairments being minimal); therefore we were able to measure how fast the modem's signal converter can send data. All of the modems within each standard group performed similarly. Any variations in performance were due to a particular modem's V.42 framing method, and to the speed with which it could break the data into frames. We concluded that there is no significant difference in performance in the transferring of noncompressible files.

Transferring the *combination file*, a combination of several file types, allowed us to determine the modem's efficiency in rebuilding the compression dictionary after it has been leveled by a long string of repeatable characters. The bidirectional transfers showed significant differences in modem performance, depending on the processors used by different manufacturers. This type of data transfer is commonly seen in remote-computing applications, in network-to-network connections, and in the use of on-line services, such as CompuServe and Prodigy.

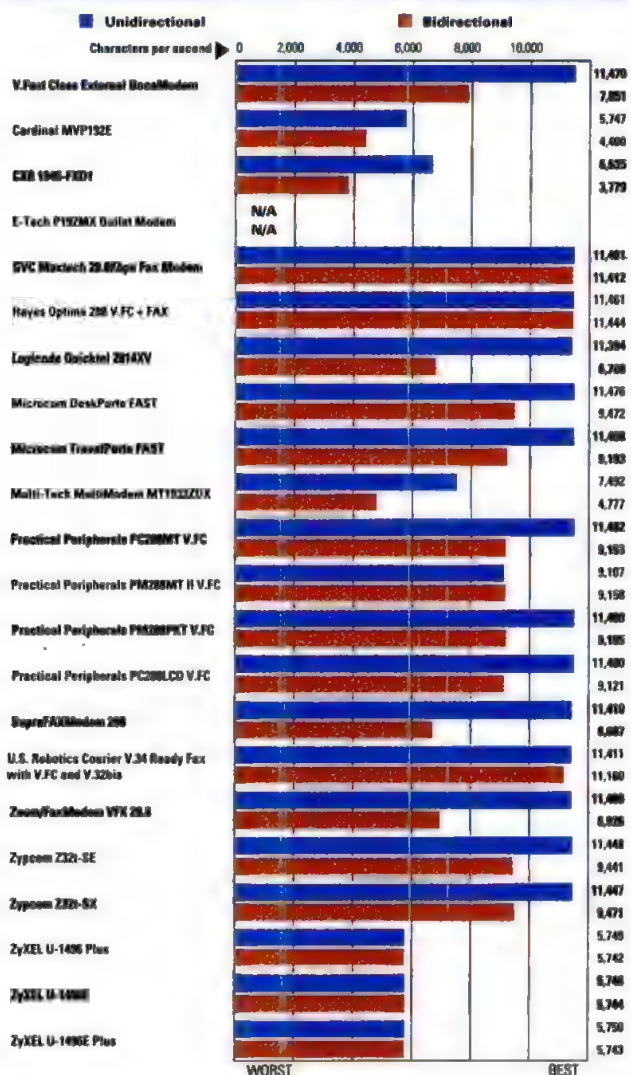
DROP ME A LINE

Some phone connections are better than others. The Electronics Industries Association/Telecommunications Industry Association (EIA/TIA) has defined a number of specific PSTN line-impairment conditions. In our Telephone Network Simulation test, we emulated 61 impairment conditions, representing 96 percent of the actual PSTN.

The Telephone Network Simulation test evaluates throughput under these various line-impairment conditions. We wanted to see how well the modem maintained its throughput and over what percentage of the telephone network model.

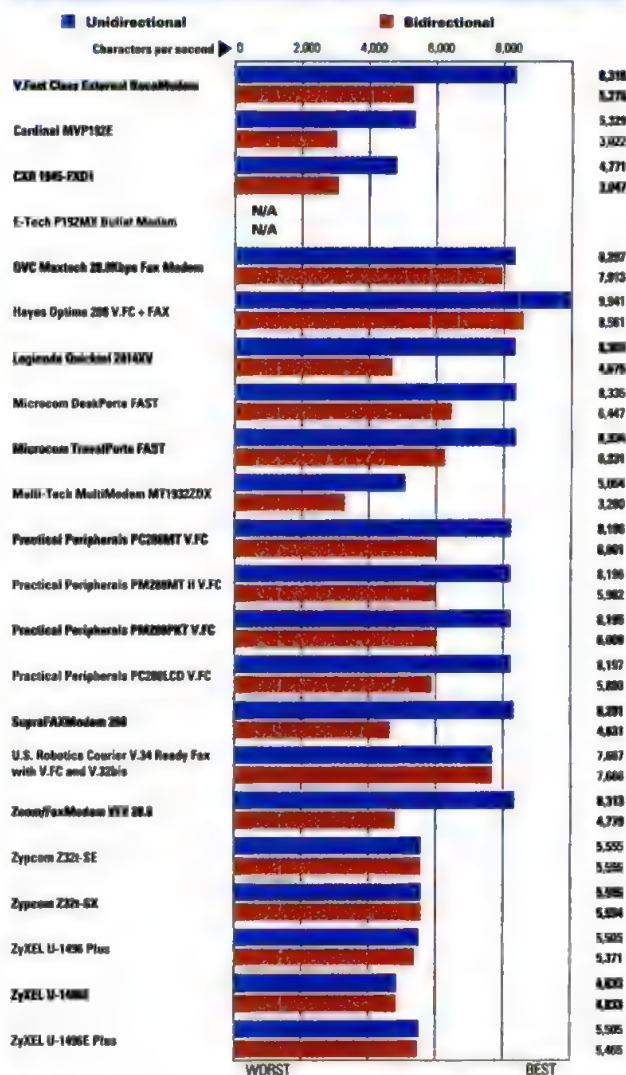
The Logicode and Zoom initially could not complete the test. When we changed a subscriber circuit (local loop) combination, these two units could not hang up and answer the

HIGHLY COMPRESSIBLE GRAPHICS FILE



N/A - Not applicable. The product could not perform this test

MODERATELY COMPRESSIBLE TEXT FILE



next call. Conversations with vendors and eventually with Rockwell revealed that this was a problem in the Rockwell firmware. Rockwell resolved the problem quickly with new firmware versions.—*Analysis written by Jeffrey G. Witt*

How We Tested

ZD Labs tested these 22 external modems, which support either the V.FC or V.32terbo interim standard. The test procedures are derived from the P.N. 2826 Draft 12 Beta C of the proposed EIA/TIA Telecommunications Systems Bulletin 38. The modem test suite evaluates modem hardware only, focusing on line interface, V.42bis compression, and V.42 error correction overhead.

For our test-bed, we used a Telecom Analysis Systems (TAS) Model 240 Voiceband Subscriber Loop Emulator together with a TAS Series II Telephone Network Emulator. The combined unit was attached to a Dell 486/33 ME, which contained a dual Enhanced Serial Port (ESP) board. This board provides two RS-232 serial connections using NS16550A FIFO UART chips.

The test software—XFR, developed by Satchell Evaluations—sends data

through one of the serial ports either unidirectionally or bidirectionally and records the throughput rate as data is received at the other serial port. The program also checks the integrity of the received data against the sent data.

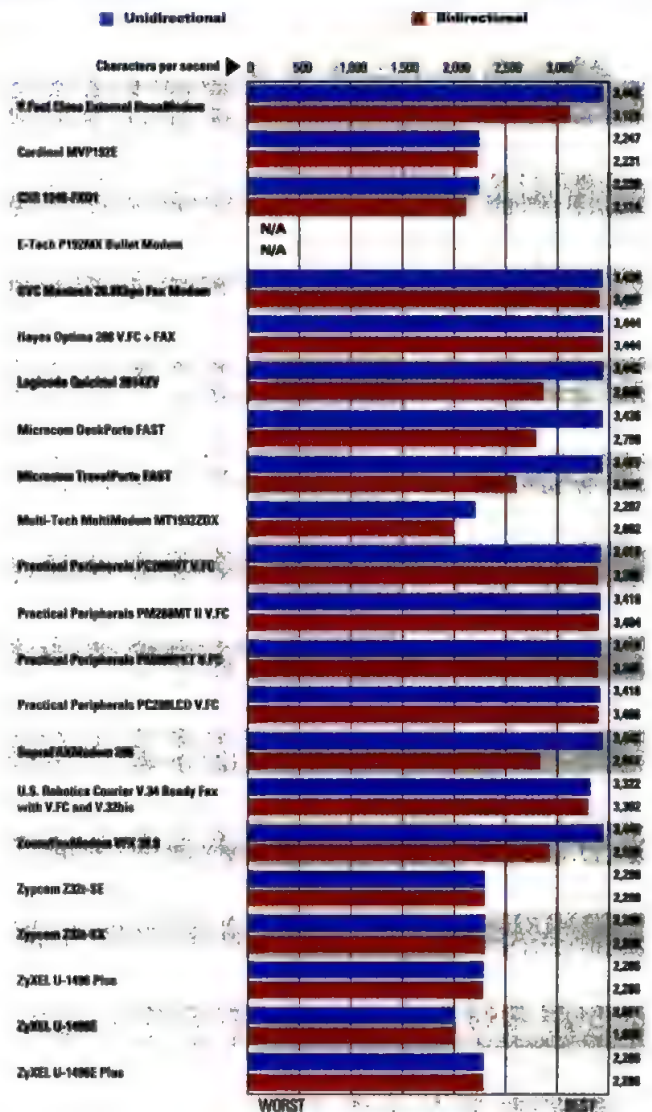
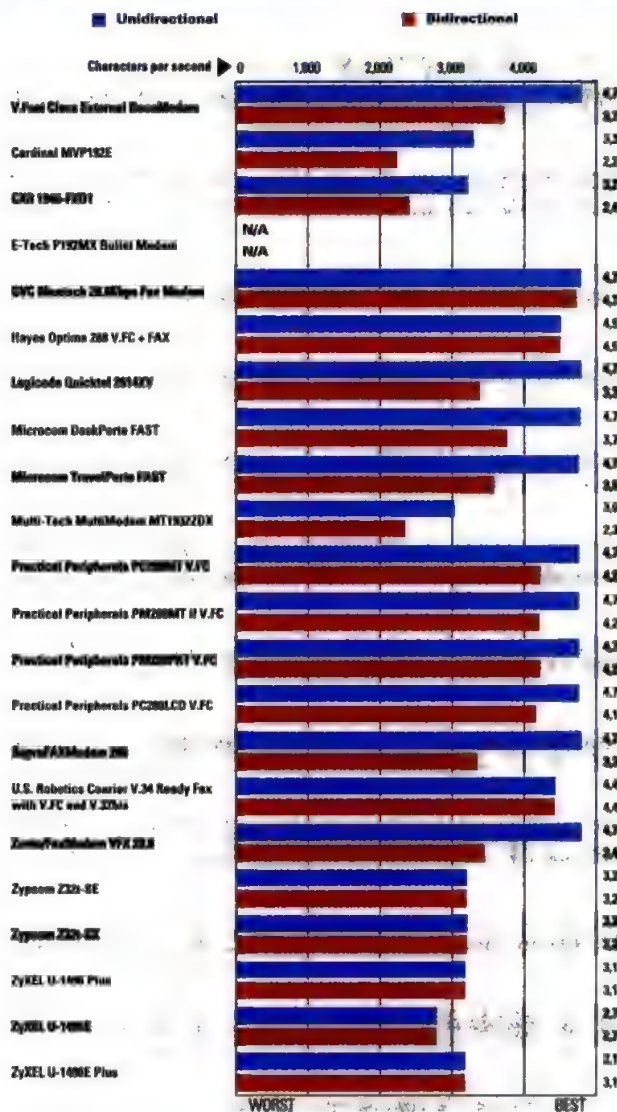
We asked each vendor to provide information enabling us to create an initialization string that would make the modem perform at its best. The setup string information included the following functions: drop DTR to terminate call, optimum fall-forward/fallback, Trellis coding, hardware (RTS/CTS) flow control, error control, compression enabled or disabled, maximum connection reporting, maximum compression dictionary size (bidirectional), no auto-answer, and speaker on or off.

Our tests transfer data between two identical modems from each vendor. We did not test transfers between modems from different vendors, because we wanted to isolate each product's performance, and earlier testing had shown that compatibility is not the difficult issue it used to be.

The first group of tests measure the modems' performance as they transmit files representing five different data types. To remove overhead caused by disk activity, each of the files is 32K, and we load all the files into memory before running the tests. We configure the TAS units for minimal line impairments.

SLIGHTLY COMPRESSIBLE EXECUTABLE

NONCOMPRESSIBLE FILE



N/A—Not applicable. The product could not perform this test.

We send each file from one modem to another, retransmitting the file until 1 million bits have passed through the first modem's signal converter, and measure the unidirectional throughput. We then repeat the procedure, trans-

mitting copies of the file in both directions at once; our bidirectional throughput scores reflect the amount of data flowing in one direction during this process.

The **Telephone Network Simulation** test is designed to evaluate a mo-

In addition, the Bullet Modem uses a 115.2-Kbps DTE communications channel to overcome bottlenecks. The user manual is fairly informative, in spite of a sparse table of contents and no index. The manual includes a chapter on error control protocols and an appendix of commands and response strings.—*Jim Wolf*

► **P192MX Bullet Modem.** List price: \$329. E-Tech Research Inc., 3525 Ryder St., Santa Clara, CA, 95051; 800-328-5538, 408-730-1388; fax, 408-730-2488.

Circle 466 on reader service card

GVC Technologies Inc.



EDITORS' CHOICE Maxtech 28.8Kbps Fax Modem

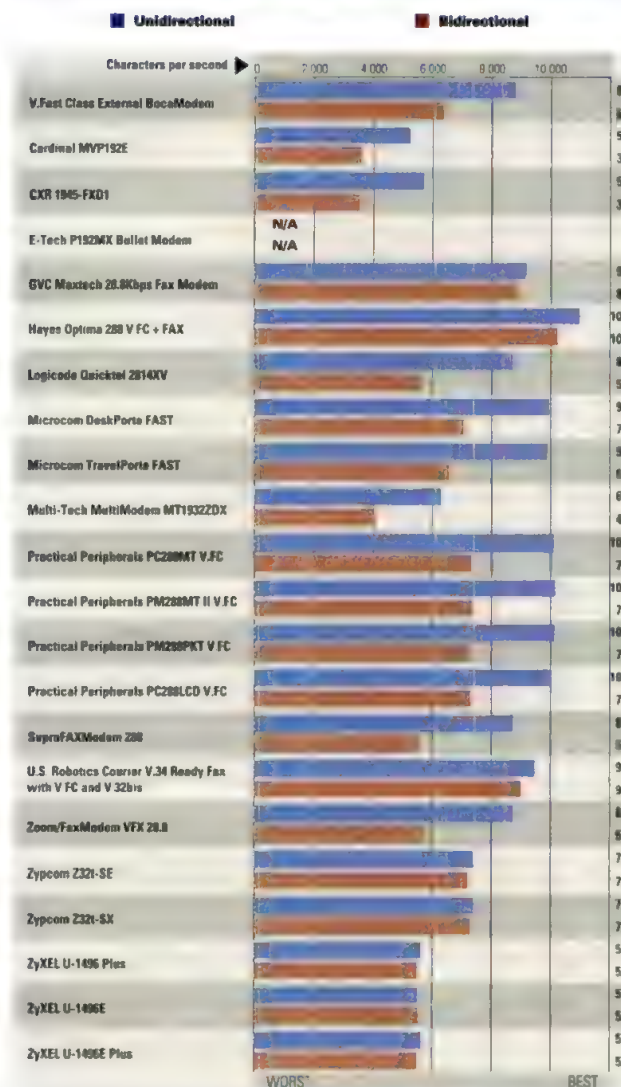
For \$199, GVC Technologies delivers a superfast V.FC modem with basic features at a reasonable price. The Maxtech 28.8Kbps Fax Modem was a top performer on our tests, beating out some bigger names here. Only one other modem in this roundup—Hayes's Optima 288—was able to perform

faster bidirectional transfers.

Including both DOS and Windows versions of COMit data communications software, as well as WinFax LITE and DOS-Fax LITE fax software, this package should appeal to many home-office users looking for a variety of basic modem features. The Maxtech's performance was in line with the fastest modems we examined, some of which cost \$200 to \$300 more. It transferred compressible data quickly, limited only by its maximum DTE speed of 115.2 Kbps on the more compressible files.

COMBINATION FILE

TELEPHONE NETWORK SIMULATION



N/A—Not applicable: The product could not perform this test.

dem's line interface. As impairments become more severe, a modem's throughput decreases as a function of a higher bit-error rate. The modem might encounter more errors in the data stream and have to request frequent retransmissions. If it decides the bit-error rate is too high, it might fall back to a slower speed. A poorly

If GVC were to add either a faster serial interface or a parallel interface, this modem would be tough to beat.

If you mostly transfer precompressed files or use software that precompresses data, you will not be restricted by the speed limit. And if you need a modem for remote computing, the Maxtech's impressive bidirectional throughput enables you to perform remote e-mail synchronization or simultaneous uploads and downloads more quickly.—*Brian Booher*

► **Maxtech 28.8Kbps Fax Modem.** List

price: \$199. GVC Technologies Inc., 376 Lafayette Road, Sparta, NJ 07836; 201-579-3630; fax, 201-579-2702.

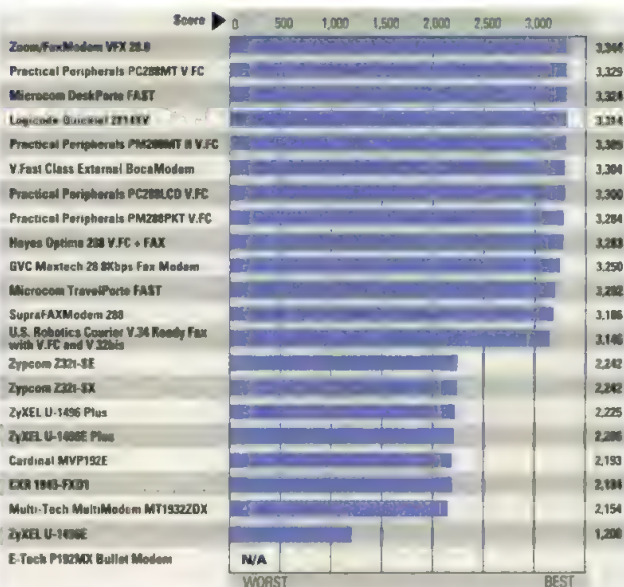
Circle 470 on reader service card

Hayes Microcomputer Products Inc.



EDITORS' CHOICE
Hayes Optima 288
V.FC + FAX

Users will feel right at home with traditional Hayes quality—and this modem was the fastest of the bunch. The Hayes Opti-



designed modem, unable to handle the impairment conditions, might receive erroneous data or simply fail to connect. We use one file type for this test: the highly compressible graphics file. The TAS simulators are configured according to the EIA/TIA committee's PSTN profile defined in the TSB-37a standards proposal.

The test lines are based on the EIA/TIA's survey of the existing telephone network, which consists of 24 types of trunk links (central office), with seven combinations of subscriber circuits (local loops), resulting in 168 different connection types with different impairments. We run the test over 61 different impairment combinations, representing 96 percent of the telephone network.

For this test we disabled compression. The data is transferred unidirectionally, just once over most of the lines and several times over the most common lines. If a modem failed a transfer on a particular line, we attempted a second call. If the modem was unable to connect after two attempts, it scored 0 characters per second for that part of the test.

To calculate each modem's score, we recorded its throughput rate for each line type and looked up the percentage of the network model the modem was able to maintain. To calculate a single weighted score from our data points, we itemized the product's separate throughput rates (using a geometric mean in cases where the product had transmitted data several times over the same line); we multiplied each rate by the percentage of the network model the modem was able to maintain, and then we summed the results.

ma 288 V.FC + FAX is an excellent choice for remote users or for connecting remote offices with dial-up routers. It is backward-compatible with most standards, so it is well-suited for use with on-line services.

This external modem works best when used with a high-speed UART serial card. Hayes sells the ESP Communications Accelerator card for \$99. If you have a laptop or are phobic about installing cards, a parallel-port modem is a better choice.

The Optima 288 is fax-capable and comes bundled with Smartcom Fax for

High-Speed Modems

Windows software; Smartcom LE for Windows is also provided to handle basic communications. DOS users are not quite as lucky—they can obtain similar software only by sending in a nominal fee (\$10) and waiting for the software to arrive.

The modem uses the Rockwell chip set, which supports a subset of V.34. An upgrade will be offered for a reasonable fee (\$49) and will likely require a chip swap via a trade-in or do-it-yourself kit.

Some types of compressible data will benefit from Hayes's efficient implementation of V.42bis: It uses a large dictionary to look up previous data patterns. Indeed, Hayes's efficiency and raw modem speed will soon have users clamoring for faster applications.—TK

► **Hayes Optima 288 V.FC + FAX.** List price: \$579. Hayes Microcomputer Products Inc., P.O. Box 105203, Atlanta, GA 30348; 800-964-2937, 404-441-1617; fax: 404-449-0087.

Circle 485 on reader service card

Logicode Technology Inc.

• Quicktel 2814XV

Form and function come together in the Quicktel 2814XV V.FC modem. Logicode Technology packages its modems in wedge-shaped cases that suggest their speed. The design also gives you three ways to situate the modem: lying flat, standing upright, or attached to your monitor (using the included bracket). The Quicktel is well priced at \$249; its performance placed it in the middle of our modem roundup.

Quicktel buyers get icon-shaped signal lights instead of the venerable two-character abbreviated labels over or under single LEDs. Modem veterans may be looking up icon definitions for a while, but newcomers probably won't miss the old lights. (Maybe graphical interfaces are as good an idea for modems as they are for most everything else.)

Our testing showed the Quicktel to be on a par with other V.FC modems in unidirectional testing. Its performance was not as good in the bidirectional testing, indicating a possible bottleneck in the internal engineering design. We must also note that the first Quicktel units we received failed. A second pair, with chip upgrades, worked well.

If you want your modem to look great

while you're cruising through cyberspace at 28.8 Kbps, consider the Logicode Quicktel 2814XV.—GG

► **Quicktel 2814XV.** List price: \$249. Logicode Technology Inc., 1380 Flynn Road, Camarillo, CA 93012; 800-735-6442, 805-388-9000; fax, 805-388-8991.

Circle 488 on reader service card

Microcom Inc.

• DeskPorte FAST TravelPorte FAST

Microcom has addressed its modems' potential PC-to-modem data bottlenecks by building the fix right in. Both the DeskPorte FAST and TravelPorte FAST feature a parallel-port connection, which provides the needed bandwidth to connect at higher transmission speeds. And Microcom managed to keep the prices for these V.FC modems competitive—\$519 each—considering you also get a free upgrade to V.34.

Other vendors, such as Boca and Hayes, offer high-speed serial add-in cards to solve the bottleneck problem. If you are uncomfortable with adjusting the insides of your PC or configuring interrupts and drivers, consider Microcom. We found installation of the parallel-port driver for the DeskPorte to be quick and simple—10 minutes under Windows. (The TravelPorte is perhaps even more of a champion for users of portables and is only about the size and weight of a Walkman.)

The modems include LEDs that signal the usual power, data-terminal ready, off-hook, and carrier-detect conditions. Four other LEDs indicate connection at V.22bis or V.32bis and V.FC modulation and error correction. An appealing addition is MNP 10 ACE (Adverse Channel Enhancement) technology for cellular negotiation. Remember that the modem at the other end must also support MNP 10.

Of course, there are trade-offs in using the parallel port. For one thing, this is currently a Windows-only solution; DOS users will need to use the standard serial connection. Keep in mind also that most desktops offer only one printer port. This is less important if you have a portable or a network workstation.

The proposed V.34 upgrade involves

replacing one socketed chip and installing a firmware upgrade through flash memory. It must be done at the factory.—Jeffrey G. Witt

► **DeskPorte FAST, TravelPorte FAST.** List price: \$519. Microcom Inc., 500 River Ridge Drive, Norwood, MA 02062; 800-822-8224; 617-551-1000; fax, 617-551-1021.

Circle 501 on reader service card

Multi-Tech Systems Inc.

• MultiModem MT1932ZDX

It may be light in weight, at only 8 ounces, but Multi-Tech System's entry is no lightweight. The V.32terbo MultiModem MT1932ZDX performs well for dial-in users, provides 10 LEDs, and is backed by a 10-year warranty. On the downside, you spend the \$299 for this modem knowing it has no upgrade path to V.34.

Although Multi-Tech is well known in the corporate market for dial-up communications products, the ZDX product line is the company's first venture into the small business and the home user market. The ZDX units provide off-the-shelf hardware and software for data and fax communications. Packaged with the MultiModem are Multi-Tech's own data communications programs, MultiExpress for Windows and MultiExpressFax for Windows.

The MultiModem is built on the AT&T V.32terbo chip set, delivering both 16.8- and 19.2-Kbps speeds, as well as V.17 and Group 3 fax, V.42 error control, and V.42bis compression standards.

On the Telephone Network Simulation test, the MultiModem came out slightly behind six other 19.2-Kbps modems, but ahead of the ZyXEL U-1496E modem.

The MultiModem offers moderate performance for a reasonable price. Though this modem may not be the least expensive or offer the top performance in comparison to the V.FC modems, the product is backed by an excellent warranty and offers superior manufacturing.—JGW

► **MultiModem MT1932ZDX.** List price: \$299. Multi-Tech Systems Inc., 2205 Woodale Dr., Mounds View, MN 55112; 800-328-9717, 612-785-3500; fax, 612-785-3874.

Circle 502 on reader service card

▪ What *Fast* Looks Like

V.FC and V.32terbo modems come in all sizes and shapes of fast and cool. Seems more and more like the internal works are only part of the total modem picture.



E-Tech's Bullet Modem (left) is battery powered and has four LEDs; Multi-Tech's MultiModem (right) has 10 LEDs. Neither upgrades to V.34.



The traditional Hayes look still works in the Optima 288. The user-friendly Practical Peripherals PC288LCD V.FC breaks new ground.



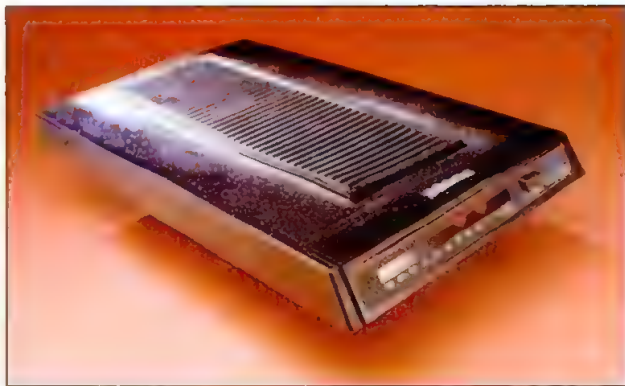
Made to fly in more ways than one, the Microcom TravelPorte FAST has a built-in parallel-port interface and plenty of LEDs.



ZyXEL's U-1496E Plus is packed with features and cleanly designed. Its informative and flexible LCD and front-panel controls are real pluses.



Logicode's sleek Quicktel is versatile and can even attach to the side of your PC. It has icon-shaped signal lights instead of labeled LEDs.



U.S. Robotics' Courier talks to everybody—including you. It has 12 LEDs and a listing of the AT command set on the bottom.

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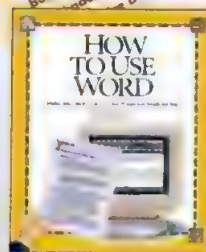
1-800-688-0448,
ext. 198 for more information.

How to Use the Mouse in Windows

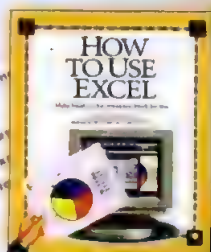
A mouse is a means of giving instructions to the computer. You're probably familiar with the keyboard as the most common input device. A mouse, so named for its bunched, coiled, tail-like cable, is a hand-held input device that along with the keyboard is one of the two input devices most people use to get by without a keyboard. Although it's possible to get by without a mouse and do all your work from the keyboard, it's not too wise. The Windows interface was designed with the mouse in mind. Keyboard alternatives can be awkward, and it's not always easy to find out what they are. Take a few minutes to learn the major mouse moves and you'll reward yourself with smoother computing.

TIP SHEET

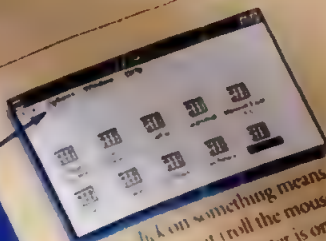
Unless told otherwise, use the left mouse button. The other mouse buttons are used so infrequently that they are always told about it.



ISBN: 184-6
Price: \$17.95



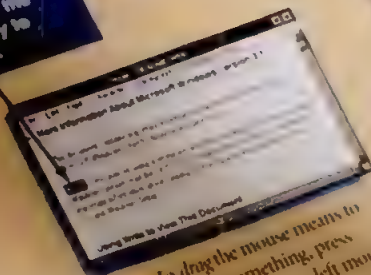
ISBN: 185-4
Price: \$17.95



2

To click on something means to point to it (roll the mouse so the mouse pointer is on top of it) and then press and instantly release the left mouse button. To double click on something means to point to it and then click the left mouse button twice in rapid succession.

Drag across a word to select it. Then press the Delete key to delete it.

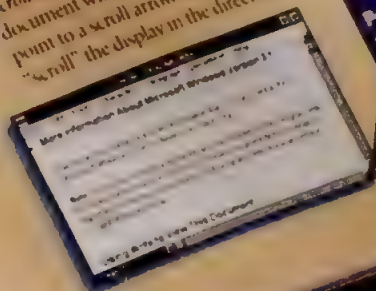


3

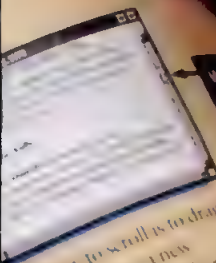
To drag the mouse means to point to something, press and hold down the left mouse button, roll the mouse, and then release the mouse button. For example, you can "select" a block of text for deletion by dragging from one end of the block to the other.

4

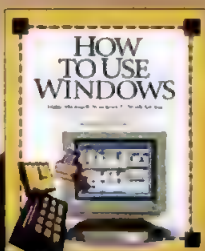
Scrolling is one of the most common mouse actions. When a document window cannot accommodate all its contents at once, point to a scroll arrow in the direction of the arrow "scroll" the display in the direction of the arrow.



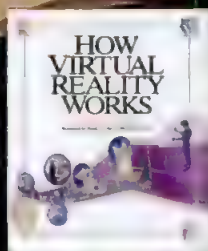
Point here and hold down the left mouse button to scroll down through the document.



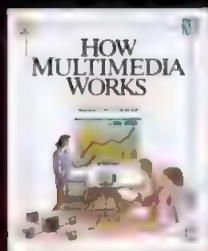
Another way to scroll is to drag the scroll bar along the scroll bar. The position of the scroll bar suggests what part of the contents you are viewing.



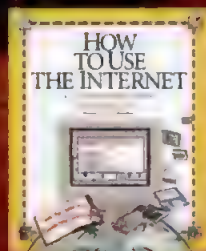
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There is a book for every major software package, with new titles publishing every month.

Practical Peripherals Inc.



EDITORS' CHOICE

Practical Peripherals

PC288MT V.FC

• **PM288MT II V.FC**

• **PM288PKT V.FC**

• **PC288LCD V.FC**

Practical Peripherals offers a good range of features and pricing in its modem line. Exhibiting top-notch performance, the Practical Peripherals PC288MT V.FC, PM288MT II V.FC, PM288PKT V.FC,

and PC288LCD V.FC are upgradable to the upcoming V.34 standard, come with streamlined documentation, and include a lifetime warranty. Two of them stand vertically and are called MiniTowers; a pocket-size portable modem and a uniquely styled LCD-equipped modem round out the offerings.

All four are built on the Rockwell V.FC chip set and, given an adequate telephone-line connection, can communicate with other V.FC modems at 28.8 Kbps. The modems are also equipped with V.42bis compression and have a computer-to-modem data rate of 115.2 Kbps.

Thus, depending on the application, you'll get some very fast throughput. All four are able to send and receive a fax at 14.4 Kbps using either Class 1— or Class 2—compatible fax software.

Practical Peripherals keeps prices down by offering modems with different feature sets for different target audiences. For example, the PC288MT (a MiniTower), is designed with leased line and synchronous communications capabilities—for the business user. The other MiniTower, the PC288MT II, is adequate for most general users. And, because it does not include the more advanced fea-

Modems Find Their Voice

By Stephen Satchell and M. David Stone
V.34 is a done deal, having been ratified while we were putting the finishing touches on this article. As you read this, V.34 modems should be on the shelf. And applications for combined point-to-point voice/data and audio teleconferencing won't be far behind. Some available products will get a boost, and the higher speeds of V.34 promise new entries.

Recently, various standards committees did some groundwork to review the offerings of all the major voice/data integration players. Voice/data functions can be separated into classes of service. Each class has increasing functionality and automation but involves more compromises. Here's a listing of the classes, with the players and their products by class.

Class 0 defines voice/data in which two separate calls are placed, one voice and one data, which are coordinated in some manner. This is perfect for ISDN, with its 2B+D architecture: You get a full voice channel and a full 64-Kbps data channel through a common terminal adapter. Under this setup, you can have full video, audio, and data capability between two points and, to a lesser extent, in a multiple-person teleconference.

You can achieve the same effect without ISDN by having two modems

connected to your system and to a pair of telephone lines. One is a dialer for the voice line, and the other provides data carriage. Another solution is even lower tech: You dial the voice connection over the telephone while the modem dials up a data connection. This is used distressingly often today, particularly by people inexperienced with telecommunications who have access to two lines.

Class 1 defines noninteractive switched voice/data systems. This is the oldest of these technologies and has been available since modems were first introduced in the 1950s. It is used today when neither end of a connection has a second line. The idea is that the two operators agree when to go to data and when to return to voice mode. Of course, this technique is about as goof-proof as sledding on ice downhill through lots of trees.

Class 2—implemented in Voice-View, from Radish Communications Systems—defines interactive switched voice/data systems. The Radish scheme interrupts voice transmission to send data when data transfer is required.

Radish will not transmit voice over the channel until the data transfer is complete, whether it was a fax, a spreadsheet, a text file, or whatever. Because the data transfer is most likely initiated by a participant, the disrup-

tion of the voice channel is an annoyance, not a problem.

Class 3 defines simultaneous voice/data systems. Two systems currently predominate. AT&T Paradyne's VoiceSpan system (currently implemented in its DataPort 2001 modem) divides the voice band into two distinct physical channels over a single connection. Data passes (or not) over one band, and voice signals pass (or not) over the other. Transmission of one type of signaling does not affect the other, so there is no inherent priority; but the required voice compression means that speech quality suffers.

Multi-Tech Supervisory Protocol (MSP) and Phylon Communications' SingleCall treat voice as just more data; they use packet-transfer methods to send data and voice over the connection at the same time. Digital speech compression makes room for data transmissions.

We expect that V.34 technology will have the most impact on Class 3 implementations. The technologies that work passably with V.32bis will work considerably better when you double the available bandwidth. Moreover, improvements in speech compression promise less space for speech—which means more space for data. □

tures of the PC288MT, it can be marketed for substantially less.

The pocket modem—PM288PKT—has its own external battery pack which holds four AA cells. It delivers 1 to 1.5 hours of constant use. Unlike many portable modems, the PM288PKT is equipped with eight LEDs to show the status of the transmission.

The newest model, the PC288LCD, has, in addition to 10 LED indicators, a three-line LCD screen that can display nearly a hundred preprogrammed messages. These include such status items as computer-to-modem communication speed, line-con-

nect rate, error-control and compression protocols, time of day, and the average data transfer rate in characters per second. It can even be programmed to display up to 24 characters in a user-defined string.

Many of the configuration commands that are normally transmitted to the PC288LCD modem from the computer can also be entered using front-panel controls. It has mode and up and down arrow buttons to select the configuration.

Practical Peripherals has further controlled costs by abbreviating the documentation to include only essential information. If, however, an enthusiastic user

needs to research an advanced topic, a detailed manual is available, in two formats, to any owner for only the cost of a phone call to the company's BBS. To move its modems to the V.34 standard, Practical Peripherals will provide an \$89 factory upgrade service.—JW

► **Practical Peripherals PC288MT V.FC.** List price: \$349. **PM288MT II V.FC.** List price: \$299. **PM288PKT V.FC.** List price: \$499. **PC288LCD V.FC.** List price: \$429. Practical Peripherals Inc., 375 Conejo Ridge, Thousand Oaks, CA 91361; 800-442-4774, 805-497-4774; fax, 805-374-7200.

Circle 506 on reader service card

■ PCMCIA . . . Almost There

By Frank J. Derfler, Jr.

If you've got one of the great new laptop PCs that comes with a PCMCIA slot, you know that PCMCIA modems are easy to carry on the road—and fast. The downside: They can result in memory conflicts, frozen applications, and frustration. But things are getting better.

PCMCIA slots showed up in volume in laptop computers at the end of 1993. Early on, a lot of products didn't work in a lot of computers. A layer of software called card and socket services (actually as many as three to four programs that logically glue the device into the PC) needed a lot of work. Developers still must tweak buffers, timing loops, and other parameters to get 100 percent interoperability between products. In this respect, though, these programs are no different from LAN card drivers, SCSI drivers, and similar programs.

Your source for the interface software is another variable. Sometimes the PC comes equipped with these programs; often the software comes with the PCMCIA device. The best advice is always to get the newest version of the card and socket services software from your dealer, the vendor's BBS, or an on-line forum. The PCMCIA product vendor typically has better software and support than the

computer vendor.

Here are some things to expect and to look for in PCMCIA modems:

Inside. Electrically, PCMCIA modems are similar to internal ISA bus modems. Amazingly, they have a UART, data pump, line transceiver, and all the other parts inside a credit card-size package.

Almost all manufacturers have settled on 16550A UART chips, so the PCMCIA modem provides a good way to work around the less capable 8550's occupying the serial port in most laptop PCs. Also, it's handy for resetting a hung modem—just pull it out and slide it back in.

Outside. The telephone-cable connection is the only part of a PCMCIA modem you see, but the vendors are competing over that. Megahertz Corporation pioneered a device, the XJack, that retracts out of sight when it's not in use. Other vendors use special external connection cables, so if you misplace the cable you cannot make a connection. However, the external-cable systems are less fragile and provide a link to the wall jack.

Memory. Memory conflicts are still PCMCIA's biggest problem. The PCMCIA installation programs typically exclude blocks of memory from memory management programs. So if you're tight on Windows memory,

adding PCMCIA makes things worse. But without these exclusions, the memory manager can load other drivers into the space and nothing works.

You can work around some of these problems by using the [menu] function in CONFIG.SYS under DOS 6.0 to load the PCMCIA drivers and memory configuration selectively when you need them.

Power. PCMCIA devices draw their power from the computer's battery. A modem draws about 7 watts while in use but about 1 watt in sleep mode. In rough numbers, modem operation can be 10 to 30 percent of the total power requirement of your laptop; so using the modem can significantly reduce your battery life.

PCMCIA products are maturing, but newly released 32-bit standards might start the evolution anew. If you're waiting for PCMCIA to come of age, consider portable modems like the Practical Peripherals PM288PKT, Telebit QBlazer, Microcom TravelPorte FAST, or U.S. Robotics WorldPort. They're only slightly bigger, have their own batteries, and are very easy to install.

Products. Xircom was one of the first companies out with a high-speed PCMCIA modem. The Xircom CreditCard Ethernet+Modem, as its name implies, combines an Ethernet LAN adapter on the same card as a 19.2-Kbps modem. □

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High-Speed Modems

Supra Corp.

● SupraFAXModem 288

The V.FC SupraFAXModem 288 is compact and well priced. It offers a large number of features and adequate performance, and it is well suited for remote access and file transfer. Its alphanumeric LCD has more than 30 status codes. The package includes Windows and DOS software, and features that distinguish incoming fax and data calls and receive incoming voice and fax calls. The SupraFAXModem 288 has good documentation and user-downloadable firmware upgrades.

This modem's performance was equal to that of other V.FC products we tested on our unidirectional file-transfer tests. Bidirectional testing revealed shortcomings in its ability to sustain two-way communications, and on the Telephone Network Simulation tests the SupraFAXModem 288 did not perform as well as other modems in this roundup. (A 16550 UART is recommended for best results.)

Supra will charge \$69 for a V.34 upgrade but will lower the price as the chips become more plentiful: For \$15, you can send in the modem and receive the upgraded modem in 10 days; for \$30, you can receive the upgrade overnight.

Finally, one quirk of design is the on/off switch. It's a spring-loaded plunger on the front that could easily be pushed inadvertently by something, say your keyboard, thus terminating your connection. If that doesn't bother you, this modem is a good choice.—JGW

► **SupraFAXModem 288.** List price: \$299.95. Supra Corp., 7101 Supra Dr. SW, Albany, OR 97321; 800-727-8417, 503-967-2480; fax, 503-967-2401.

Circle 509 on reader service card

U.S. Robotics Inc.

● Courier V.34 Ready Fax with V.FC and V.32bis

Here's your best choice for a modem that must connect at the fastest rate possible to a majority of other vendors' modems: It supports top V.FC and V.32terbo speeds. The U.S. Robotics modem also connects at top speeds with most BBSs and information services. Other V.FC modems can connect with V.32terbo modems only at

14.4 Kbps, even though terbos are capable of 19.2 Kbps. And this modem will upgrade to V.34. You do pay for all this flexibility: It lists for \$595.

The Courier can also connect to older V.32terbo Couriers that have U.S. Robotics' proprietary Adaptive Speed Leveling technology at speeds up to 21.6 Kbps. It is bundled with QuickLink II fax/communications software for Windows and DOS,

and has 12 LEDs, including a synchronous mode and error-control light.

The documentation is complete, and there's an AT-command reference printed on the bottom of the modem and one stored in its memory. The modem also has fairly powerful security; an administrator can require call-backs. On bidirectional transfers, the Courier was faster than any other modem here except the Hayes and



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• The Art of UART

By John Garriss

With modems transmitting data faster all the time, a number of modem vendors are pointing to the PC's serial controller chip—the UART—as a performance bottleneck. These vendors advocate buying either a high-performance UART or a specialized hardware and software combination to get the most out of your new modem. Is this really the truth?

The answer depends on the way you use your modem. If you are retrieving precompressed files from BBSs or an on-line service, you're probably fine using what you have. If, however, you spend a lot of time transferring highly compressible files, or if you use a remote control package to access another PC, you may want to consider these products.

The UART, or Universal Asynchronous Receiver/Transmitter chip, sits on the PC's serial port and handles the communication between the modem and the PC. When data goes from your PC to your modem, or vice versa, it must go through your UART chip. Furthermore, you can control the speed at which your modem and computer communicate. This speed is called the DTE (data terminal equipment) rate, and it can usually be configured through your communications software.

The DTE rate you should use depends primarily on the speed of your modem and the kind of data you are transmitting. For example, if you have a 28.8-Kbps modem using V.42bis compression with a ratio of 4 to 1, then you should set your DTE to 28.8 times 4, or 115.2 Kbps, for optimal performance.

Most PCs today ship with either an 8250 or a 16450 UART chip. The problem with these chips is that if you set your DTE rate too high, your computer may not be able to fetch all the data coming off the serial port without dropping bytes.

Although it is technically possible

to run an 8250 or 16450 UART chip at speeds of up to 115.2 Kbps, several other factors can complicate the situation. For example, a slower processor cannot handle interrupts as quickly as a faster one; even a faster processor can get overloaded under a multitask-

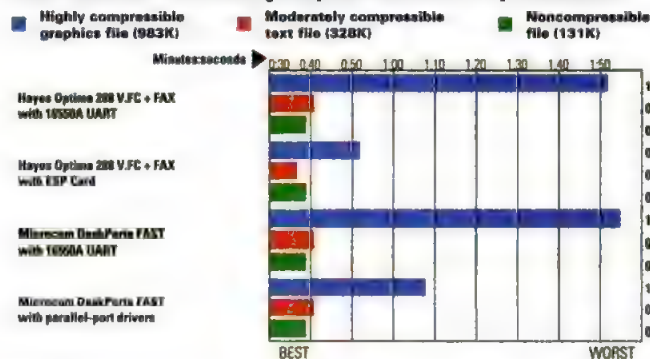
TravelPorte FAST. These drivers allow you, when using Windows, to redirect your COM port to use your parallel port for transmitting data. This eliminates the problems associated with serial transmissions. Also, DigiBoard markets a family of multi-

port cards that have data buffering and processing.

We tested the Hayes and Microcom products at ZD Labs to see if they really offered better performance. We ran each solution on a pair of Dell 486/66 MEs with 16MB of RAM running Hayes Smartcom for Windows; we simu-

Breaking the Bottleneck

The data-transfer bottleneck is not your modem; it's the UART. Hayes and Microcom sell products that alleviate the UART bottleneck on your PC so that you can at least take full advantage of your modem's fastest speed. We tested transfer times of Hayes and Microcom modems for files of varying compressibility to see whether these options make a difference. The results: a significant improvement in transfer times for highly compressible files, but little difference for moderately compressible and noncompressible files.



ing OS or running a number of TSRs.

If you are finding errors or retransmissions when using high DTE settings, try upgrading to a 16550A. These chips offer a number of improvements that let you set your DTE to a higher speed, including a 16-byte buffer for sending and receiving data.

A few companies have introduced products they say do an even better job of alleviating the UART bottleneck. Hayes Microcomputer Products ships a 16-bit ISA card called the ESP Communications Accelerator, which improves on the 16550A by adding two 1,024-byte buffers for incoming and outgoing data. Hayes advertises transmission speeds "approaching 230,400 bps" when the ESP card is used with the Hayes Optima 288 V.FC + FAX.

Microcom includes parallel-port drivers with its DeskPorte FAST and

lated a telephone line with Processing Telecom Technologies' Central Office Simulator, model PTT 5102.

We used the Hayes Optima 288 to test the ESP board and the Microcom TravelPorte FAST to test the parallel-port drivers. In each case, we ran tests using the vendor's solution and compared it to tests using a 16550A UART as the reference standard. When we sent highly compressible data across the modem lines, both products gave faster times. But when we sent noncompressible data, these products made no difference.

Performance considerations aside, there are some caveats. For example, applications must be tailored specifically to use the Hayes ESP or Microcom boards; otherwise they will default to a standard 16550A. Your own package may not give you better performance. □



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SUMMARY OF FEATURES

High-Speed Modems

■ Upgradable to V.34
□ Not upgradable to V.34

Products listed in review order

■ = YES □ = NO

	PC MAGAZINE ★★★★★ ★★★★★				PC MAGAZINE ★★★★★ ★★★★★			
	Boca Research Inc.	Cardinal Technologies Inc.	CXR (Anderson Jacobson)	E-Tech Research Inc.	GVC Technologies Inc.	Hayes Microcomputer Products Inc.	Logicode Technology Inc.	Microcom Inc.
	V.Fast Class External BocaModem	Cardinal MVP192E	CXR 1945-FXD1	P192MX Bullet Modem	Maxtech 28.8Kbps Fax Modem	Hayes Optima 288 V.FC + FAX	Quicktel 2814KV	DeskPorte FAST
List price	\$345.00	\$199.00	\$695.00	\$329.00	\$199.00	\$579.00	\$249.00	\$519.00
Modem type	V.FC	V.32terbo	V.32terbo	V.32terbo	V.FC	V.FC	V.FC	V.FC
Interface	Serial	Serial	Serial	Serial	Serial	Serial	Serial	Parallel or serial
Chip set manufacturer	Rockwell	AT&T	AT&T	AT&T	Rockwell	Rockwell	Rockwell	Rockwell
Firmware version tested	1.00	E208CAMJ	69-51945-030/040	6.0	6.0W	3.1	1.0	1.3/85
Communications software included	COMit LITE for DOS and Windows	COMit for Windows	None	QuickLink II Win/DOS	COMit LITE for DOS and Windows	Smartcom LE for Windows	COMit LITE for DOS and Windows	Mini
Fax software included	FaxWorks for DOS and Windows	FaxWorks for Windows	None	QuickLink II Win/DOS	DOSFax LITE, WinFax LITE	Smartcom Fax for Windows	DOSFax LITE, WinFax LITE	FaxWorks for Windows
Physical Characteristics								
Dimensions (inches)	1 x 5 x 7.5 (HWD)	1.3 x 5.5 x 8.6 (HWD)	1.5 x 6.8 x 11.5 (HWD)	1.3 x 4.5 (H x diameter)	1.3 x 4.8 x 7 (HWD)	1.3 x 5.5 x 9.5 (HWD)	2 x 6 x 6 (HWD)	1.3 x 6.8 x 8.3 (HWD)
Location of power switch	Back	Back	Back	Side	Back	Back	Side	Front
Speed indicators	□	■	■	□	■	■	■	■
UART serial card	16550 UART	None	None	None	None	None	None	N/A
Phone/serial cable	■ ■	■ □	■ □	■ ■	■ □	■ □	■ □	■ ■
Protocols Supported								
Standard data modulation	Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis
Other data modulation	V.22, V.FC	V.21, V.22, V.32terbo	V.21, V.23, V.32terbo	V.21, V.22, V.23, V.32terbo	V.21, V.22, V.FC	V.21, V.22, V.FC	V.21, V.22, V.23, V.FC	V.21, V.22, V.23, V.FC
Data compression	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5
Error control	V.42, MNP 2-4	V.42, MNP 2-4	V.42, MNP 4	V.42, MNP 1-4	V.42, MNP 2-4	V.42, MNP 2-4	V.42, MNP 4	V.42, MNP 2-4, 10
Fax capability	Group 3	Group 3	Group 3	Group 3	Group 3	Group 3	Group 3	Group 3
Fax standards	Class 1 and 2	Class 1 and 2	Class 1 and 2	Class 2	Class 1 and 2	Class 1	Class 1 and 2	Class 1 and 2
Miscellaneous								
Caller ID support	□	□	□	■	□	□	■	□
V.34 upgrade path	■	□	□	□	■	■	■	■
Upgrade price	\$49	N/A	N/A	N/A	\$39	\$49	\$75	Free
Upgrade method	Factory	N/A	N/A	N/A	Factory	User or factory	Factory	User or factory
Technical Support								
AT-command reference	■	■	■	■	■	■	■	□
Quick-reference card	□	□	□	■	□	□	■	□
Background information on communications	□	■	□	■	■	□	□	■
Technical-support number	407-241-8088	717-293-3124	800-537-5762	408-730-1399	201-579-3630	404-441-1617	805-388-9000	617-561-1313
BBS number	407-241-1601	717-293-3074	None	408-730-2120	201-579-2380	800-874-2937	800-230-8632	617-255-1125
Fax-back number	407-995-9456	800-775-0899	None	None	None	800-429-3739	None	800-265-2802
Free support/Toll-free number	■ □	■ □	■ ■	■ □	■ □	■ □	■ □	■ □
Warranty	5 years	Lifetime	3 years	2 years	5 years	2 years	Lifetime	5 years

N/A — Not applicable. This modem can connect to the PC via a parallel port.

N/A — Not applicable. The vendor does not offer an upgrade for this product.

* Free support consists of prerecorded information only.

NETWORKING

High-Speed Modems

CONTINUES



Microcom Inc.	Multi-Tech Systems Inc.	Practical Peripherals Inc.	Practical Peripherals Inc.	Practical Peripherals Inc.	Practical Peripherals Inc.	Supra Corp.	U.S. Robotics Inc.	Zoom Telephonics Inc.
TravelPorte FAST	MultiModem MT1932ZDX	Practical Peripherals PC288MT V.FC	Practical Peripherals PM288MT II V.FC	Practical Peripherals PM288PKT V.FC	Practical Peripherals PC288LCD V.FC	SupraFAX-Modem 288	Courier V.34 Ready Fax with V.FC and V.32bis	Zoom/Fax-Modem VFX 28.8
\$519.00	\$299.00	\$349.00	\$299.00	\$499.00	\$429.00	\$299.95	\$595.00	\$299.00
V.FC	V.32terbo	V.FC	V.FC	V.FC	V.FC	V.FC	V.FC, V.32terbo	V.FC
Parallel or serial	Serial	Serial	Serial	Serial	Serial	Serial	Serial	Serial
Rockwell	AT&T	Rockwell	Rockwell	Rockwell	Rockwell	Rockwell	U.S. Robotics	Rockwell
1.3/85	0111A	3.15	3.15	3.15	3.15	0.510-13-DS39F VFC	5/11/94	1.000b-FVCK-32
None	MultiExpress for Windows	QuickLink II Win/DOS	QuickLink II Win/DOS	QuickLink II Win/DOS	QuickLink II Win/DOS	COMit for DOS and Windows	QuickLink II Win/DOS	COMit for DOS and Windows
FaxWorks for Windows	MultiExpressFax for Windows	QuickLink II Win/DOS, WinFax LITE	QuickLink II Win/DOS	QuickLink II Win/DOS	QuickLink II Win/DOS, WinFax LITE	FaxTalk for Windows	QuickLink II Win/DOS	DOSFax LITE, WinFax LITE
1.3 x 2.8 x 4.3 (HWD)	1 x 4.5 x 5.6 (HWD)	1.1 x 4.6 x 6.8 (HWD)	1.1 x 4.6 x 6.8 (HWD)	1.2 x 2.3 x 4 (HWD)	6.3 x 2.8 x 3.8 (HWD)	1 x 4.6 x 6.5 (HWD)	1.5 x 6.4 x 10.4 (HWD)	1.6 x 8.5 x 6.1 (HWD)
Back	Side	Back	Back	Side	Front	Front	Back	Back
■	■	□	□	□	■	■	■	■
N/A	None	None	None	None	None	None	None	None
■ ■	■ □	■ □	■ □	■ □	■ □	■ ■	■ □	■ □
Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis
V.21, V.22, V.23, V.FC	V.22, V.32terbo	V.21, V.22, V.FC	V.21, V.22, V.FC	V.21, V.22, V.FC	V.21, V.22, V.FC	V.21, V.22, V.23, V.FC	V.23, V.25, V.25bis, V.32terbo, V.FC, HST, HST Cellular	V.21, V.22, V.22 A/B, V.23, V.FC
V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5
V.42, MNP 2-4, 10	V.42, MNP 3-4	V.42, MNP 2-4	V.42, MNP 2-4	V.42, MNP 2-4	V.42, MNP 2-4	V.42, MNP 2-4, 10	V.42, MNP 2-4	V.42, MNP 10
Group 3	Group 3	Group 3	Group 3	Group 3	Group 3	Group 3	Group 3	Group 3
Class 1	Class 2	Class 1 and 2	Class 1 and 2	Class 1 and 2	Class 1 and 2	Class 1 and 2	Class 1 and 2	Class 1 and 2
□	□	■	■	■	■	■	□	□
■	□	■	■	■	■	■	■	■
Free	N/A	\$89	\$89	\$89	\$89	\$89	Free	\$99
Factory	N/A	Factory	Factory	Factory	Factory	Factory	User	Factory
□	■	■	■	■	■	■	■	■
□	□	■	■	■	■	■	■	□
■	■	□	□	□	□	■	■	■
617-551-1313	800-972-2439	805-496-7707	805-496-7707	805-496-7707	805-496-7707	800-774-4965	800-550-7800	617-423-1076
617-255-1175	800-392-2437	805-496-4445	805-496-4445	805-496-4445	805-496-4445	503-967-2444	708-962-5092	617-423-3733
800-285-2802	None	800-225-4774	800-225-4774	800-225-4774	800-225-4774	503-967-0072	800-762-6163	None
■ □	■ ■	■ □	■ □	■ □	■ □	■ ■	■ ■	■ □
5 years	10 years	Lifetime	Lifetime	Lifetime	Lifetime	5 years	2 years	7 years

► **S U M M A R Y O F F E A T U R E S**

ENDS

■ Upgradable to V.34
□ Not upgradable to V.34

Products listed in review order	Zypcom Inc.	Zypcom Inc.	ZyXEL	ZyXEL	ZyXEL
■ = YES □ = NO	Zypcom	Zypcom	ZyXEL	ZyXEL	ZyXEL
	Z32t-SE	Z32t-SX	U-1496 Plus	U-1496E	U-1496E Plus
List price	\$419.00	\$629.00	\$749.00	\$349.00	\$499.00
Modem type	V.32terbo	V.32terbo	ZyX 19.2	ZyX 16.8	ZyX 19.2
Interface	Serial	Serial	Serial	Serial	Serial
Chip set manufacturer	AT&T	AT&T	ZyXEL	ZyXEL	ZyXEL
Firmware version tested	1.06	1.06	6.12 P	6.12 EP	6.12 EP
Communications software included	None	None	Cybersoft for Windows	Cybersoft for Windows	Cybersoft for Windows
Fax software included	None	None	ZFAX with Voice Software (DOS)	ZFAX with Voice Software (DOS)	ZFAX with Voice Software (DOS)
Physical Characteristics					
Dimensions (inches)	1.5 x 4.5 x 7.5 (HWD)	1.5 x 4.5 x 7.5 (HWD)	1.8 x 8.8 x 10.5 (HWD)	1.5 x 6.5 x 10.5 (HWD)	1.5 x 6.5 x 10.5 (HWD)
Location of power switch	Side	Side	Back	Back	Back
Speed indicators	■	■	■	■	■
UART serial card	None	None	None	None	None
Phone/serial cable	■□	■□	■□	■□	■□
Protocols Supported					
Standard data modulation	Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis	Bell 103, Bell 212, V.22bis, V.32, V.32bis
Other data modulation	V.13 synchronous mode, V.21, V.22, V.23, V.32terbo	V.13 synchronous mode, V.21, V.22, V.23, V.32terbo	V.21, V.22, V.23, V.26bis, V.33, 16.8Kbps, 19.2Kbps	V.21, V.22, V.23, 16.8Kbps	V.21, V.22, V.23, 16.8Kbps, 19.2Kbps
Data compression	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5	V.42bis, MNP 5
Error control	V.42, MNP 2-4	V.42, MNP 2-4	V.42, MNP 3-4	V.42, MNP 3-4	V.42, MNP 3-4
Fax capability	Group 3	Group 3	Group 3	Group 3	Group 3
Fax standards	Class 1 and 2	Class 1 and 2	Class 2 and 2.0	Class 2 and 2.0	Class 2 and 2.0
Miscellaneous					
Caller ID support	□	■	■	■	■
V.34 upgrade path	□	■	■	■	■
Upgrade price	N/A	\$199	\$249	\$249	\$249
Upgrade method	N/A	Factory	Factory	Factory	Factory
Technical Support					
AT-command reference	■	■	■	■	■
Quick-reference card	□	□	■	■	■
Background information on communications	□	□	■	■	■
Technical-support number	510-783-2501	510-783-2501	714-693-0808	714-693-0808	714-693-0808
BBS number	None	None	714-693-0762	714-693-0762	714-693-0762
Fax-back number	None	None	None	None	None
Free support/Toll-free number	■□	■□	■□	■□	■□
Warranty	2 years	2 years	5 years	5 years	5 years

N/A—Not applicable: The vendor does not offer an upgrade for this product.

GVC units. But it scored poorly on the uni-directional transfers, finishing last among V.FC modems on the text, executable, and noncompressible file tests.—BB

► **Courier V.34 Ready Fax with V.FC and V.32bis.** List price: \$595. U.S. Robotics Inc., 8100 N. McCormick Blvd., Skokie IL 60076; 800-342-5877, 708-982-5001; fax, 708-982-5235.

Circle 512 on reader service card

Zoom Telephonics Inc.

• **Zoom/FaxModem VFX 28.8**

The Zoom/FaxModem VFX 28.8, well priced at \$299, is designed to accomplish its tasks in adverse environments and over a variety of telephone networks. It even is equipped with a metal shield to protect the controller chip and the signal

converter. This neutralizes the vulnerability of the plastic case, which would otherwise leave the inner hardware susceptible to electromagnetic interference.

The attention paid to robustness was made evident by the Zoom product's superb performance on the Telephone Network Simulation test; it scored better than any other modem in the roundup. Its performance on bidirectional data-transfer tests was below average.

The Zoom/FaxModem features a comprehensive set of 15 LEDs, including indicators for 28.8- and 14.4-Kbps speeds. The package comes complete with the COMit communications software for Windows and DOS, as well as WinFax LITE and DOSFax LITE. You can upgrade your Zoom modem from its Rockwell V.FC chip set to the V.34 standard for \$99.

The Zoom/FaxModem is good for users who need to establish high-speed connections in all areas and environments of the telephone network. But if fast performance is your principal criterion, there may be better choices.—JY

► **Zoom/FaxModem VFX 28.8.** List price: \$299. Zoom Telephonics Inc., 207 South St., Boston, MA 02111; 800-666-6191, 617-423-1072; fax, 617-423-9231.

Circle 513 on reader service card

Zypcom Inc.

• **Zypcom Z32t-SE**
• **Zypcom Z32t-SX**

The Zypcom V.32terbo modems are aimed at different markets. For \$629, the Zypcom Z32t-SX, with its fast performance and strong feature set, should appeal to an IS manager. It includes support for leased-line connections, error control, dial-back, caller ID, and an upgrade path to V.34. The fact that it came with no bundled software further reveals its best use—for linking LANs over dial-up or leased lines or remote access.

In addition to 2-wire dial-up, the Z32t-SX also supports 2- and 4-wire connections over leased lines in both synchronous and asynchronous modes. The modem can be configured remotely for centralized control. It also includes Zscript, a modem scripting language with which a user can create log-on scripts for automated connections.

A Ferrari on City Streets?

By Robert P. Lipschutz

Do the math, the what-if analysis, the careful back-of-the-envelope calculations: 28.8-Kbps modems are twice as fast as their older 14.4-Kbps cousins. And with early indications that they won't cost you much more—one of our top performers, GVC's Maxtech, lists at \$199—many bet that 28.8-Kbps modems will quickly become ubiquitous.

But when should you join in and purchase that shiny new modem with the fast engine? Keep in mind that a 28.8-Kbps modem won't help you if the modem on the other end has a lower modulation rate. Modems with different modulation speeds will negotiate down to the lesser modem's maximum speed or even lower, depending on line quality. Don't think you can average the modulation speeds together to get some mean connect speed. It doesn't work that way.

Let's consider how well prepared the following situations are to take full advantage of 28.8-Kbps modems.

ON-LINE SERVICES AND BBSs

Your modem provides a link to myriad on-line services and bulletin board systems (BBSs). This is why many people purchase a modem in the first place. So how will a new 28.8-Kbps modem help here?

The answer depends upon your providers: *You* can't get 28.8 until *they* get 28.8. It's that simple—they control the game. You need to know if they have a 28.8 modem and how much it will cost you to connect at that speed.

Many BBSs have adopted 28.8 modems and often don't charge any more for connection at that speed

than at lower speeds. The big on-line services (such as America Online, CompuServe, and Prodigy) are more conservative because they must replace hundreds of modems. Most of them will charge more for access at the 28.8-Kbps speeds, if they have them at all. If your provider has taken the plunge, you may want to check out unidirectional performance on our performance testing for indications of which modems will perform best.

REMOTE ACCESS TO A NETWORK

Two recent stories ("Extend Your Reach" and "How to Be in Two Places at Once" in our issue of August, 1994) looked at how users can remotely access their network. For remote access, especially file transfers, 28.8 modems will make a big difference.

On the network side, look for a

28.8 modem that did well on both our unidirectional and bidirectional performance tests. On the remote side, mobile users will want a portable modem such as Practical Peripherals' PM288PKT, E-Tech's P192MX Bullet Modem, or Microcom's Travel-Porte FAST. PCMCIA 28.8-Kbps modems may be available by the time you read this. Remote access should show the first real benefits of 28.8 modems because you can be sure there is one on each side of the connection.

CONNECTING LANS TOGETHER

"Speaking LAN to LAN," in our issue of May 31, 1994, explored dial-up routers. These devices connect two networks along standard analog telephone lines. In our testing, we used 14.4-Kbps V.32bis modems because most 28.8 modems were not yet shipping. We also encouraged users to

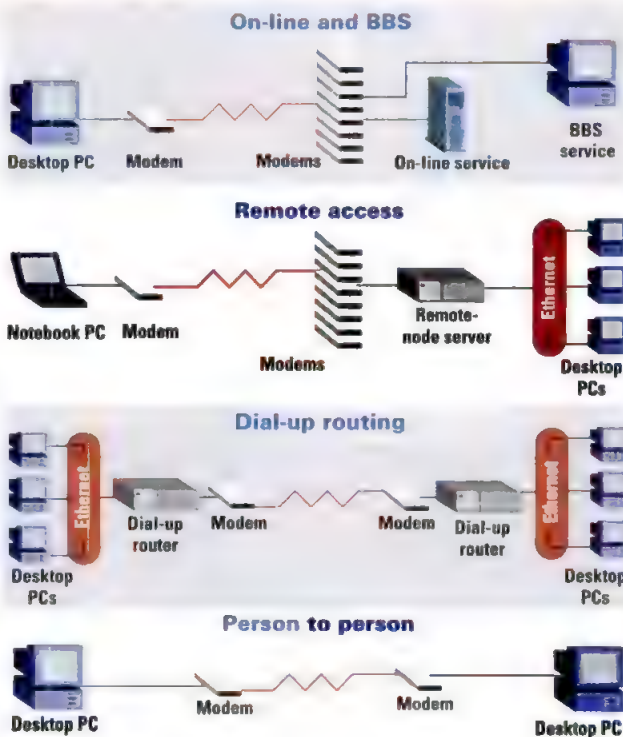
purchase the faster modems when they became available.

Now they are available. Make sure that the dial-up router you choose supports 28.8 modems, or get a guaranteed upgrade. Examine both the unidirectional and bidirectional performance tests to determine which modems perform best.

PERSON TO PERSON

If you use your modem to transfer files to friends and associates, you'll reap the benefits of a 28.8-Kbps modem only if both of you have made the plunge. Just like MCI's Friends and Family Plan, you'll want all your modem partners to have a 28.8 modem. Coerce, beg, plead, and promise. Get them on the 28.8 bandwagon. □

Where to Use That 28.8-Kbps Modem



High-Speed Modems

The Zypcom Z32t-SE equals the Z32t-SX in performance, but it doesn't approximate the feature set. It also lists for a lot less, at \$419. It cannot connect over leased lines, nor does it include Zscript or caller ID. And, although you can upgrade a Z32t-SE to a Z32t-SX—for \$199—you cannot upgrade it to support V.34.

The Zypcom modems, thanks to a 115.2-Kbps DTE speed, finished first among V.32terbo modems on our (highly compressible) graphics and combination file-transfer tests, by a wide margin. On the other file-transfer tests, in which the modems were not limited by DTE speed,

the Zypcoms finished on top, but by a smaller margin. Their bidirectional performance was good.

In the Telephone Network Simulation test, the Zypcoms were able to transfer data at their maximum speed over 95 percent of our model. Even if you encounter a particularly bad line, a pair of Zypcom modems connect at their maximum speed with error control enabled, using the proprietary Adaptive Connect Speed feature.—BB

► **Zypcom Z32t-SE.** List price: \$419. **Zypcom Z32t-SX.** List price: \$629. Zypcom Inc., 2301 Industrial Pkwy. West, Bldg. 7,

Hayward, CA 94545; 510-783-2501; fax, 510-783-2414.

Circle 518 on reader service card

ZyXEL

- **ZyXEL U-1496 Plus**
- **ZyXEL U-1496E**
- **ZyXEL U-1496E Plus**

Besides data, fax, and outstanding voice capabilities, the ZyXEL proprietary modems are packed with features, including LEDs, security, line and self diagnostics, voice mail, error correction,

• AT Your Command

By *Brendon M. Macaraeg*

That alphabet soup your communications program spits out every time you dial an on-line service is the AT Command Set. Those seemingly cryptic alphanumeric combinations in your modem's initialization (init) string are what communications software uses to control the modem.

Unfortunately, there is no standard AT Command Set. Each vendor creates the commands needed to activate features on their modems. The bottom line: Don't throw that manual away.

A good comm package shields you from the AT Command Set: The modem uses a predefined init string chosen from a list of modem models. Or the package will construct an init string depending on what settings you enter in the software. Still, it's good to know some basic commands. If you can enter terminal mode (some comm packages may not allow it), you can enter AT commands manually to stay in touch even if your comm package fails. (Don't throw that manual away!)

FOR STARTERS

Start your comm software and enter terminal mode. To see if your modem is ready, type "AT" and hit Enter. It should respond with an "OK" on your screen, as it should each time you enter a command except for dialing and

requesting stored settings. Depending on your phone service, the modem will dial either in tone or pulse mode. To dial a number in tone mode, enter "ATDT [phone number]". To dial in pulse mode, enter "ATDP [phone number]". D specifies dial; T and P specify tone and pulse, respectively.

TALK TO ME

Your modem can tell you what is happening as you dial and connect, but it needs the correct commands to do so. Putting "Q0" and "V1" in your init string tells the modem to give result codes in words rather than numbers. If this command is not in your modem's factory default settings, enter "ATQ0V1" manually.

The ATX command determines the feedback the modem gives as a call progresses. Settings range from 0 to 4, depending on the modem vendor (some modems can tell you if error control and data compression are active when the modem connects). ATX4 is recommended: It tells the modem to report the connection speed and a busy signal or lack of dial tone, if detected.

QUIET TIME

Good comm software will let you turn your modem speaker off. If yours doesn't, you can do it manually. Entering "ATM0" in terminal mode will

shut the speaker off at all times, unless your comm package initializes the modem before it dials.

Variations include M1 (speaker on while dialing, off after the connection is made), M2 (speaker always on), and M3 (speaker off while dialing, on until the comm session is ended). To have the speaker off at all times, we recommend you place "M0" in the init string.

FAIL SAFE

AT&F is arguably the most important AT command. If you mangle the settings so your modem will not work, entering "AT&F" will reset the modem to the factory default settings. But beware: Some vendors offer multiple factory default settings, and AT&F will wipe out all previous settings. A safer option is ATZ, which will reset the modem to its default wake state.

Some of the modems in our review include on-line directories of commands. Practical Peripherals delivers six screens of on-line help when you enter "AT\$H".

With V.34 imminent, you'll want to see if the firmware version has changed once you actually upgrade. The command ATI3 returns the firmware version number on many modems. Of course, other vendors may use a different command. So don't throw that manual away! □

Not Enough Time To Get Everything Done?



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ACE utilizes Mwave Technology from IBM Microelectronics and provides DSP power  to upgrade and grow as your needs change.



Suggested list price for ACE Model 5000 is \$299

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CIRCLE 145 ON READER SERVICE CARD

■ It's V.34, Smile for the Camera

By Stephen Satchell

Having V.34 in your modem is like having a complete system of Nikon 35-mm camera bodies, motor drives, and lenses available to shoot pictures in any situation. V.32bis is, by comparison, like a Polaroid camera—it's good, but limited in what it can do.

For the additional complexity that is V.34, you get a lot. A pair of good V.34 modems will take careful measure of the phone connection, pick the optimal combination of signaling tools, and push data through for you with minimum error at the highest obtainable speed.

But saying "V.34 communicates at a top rate of 28.8 Kbps" is a little like saying "the longest fast Nikon lens is 300 mm." Nikon offers a wide range of lenses, and V.34 defines up to 118 combinations of symbol rate, carrier frequency, and coding patterns to transfer data at 12 data rates. Those rates range from 2,400 bps to 28.8 Kbps.

If that weren't enough, V.34 modems have as many troubleshooting options as a photographer has gadgets: signal power control, preemphasis, precoding, shaping, shell mapping, and nonlinear coding. (Don't worry, it's all automatic.) All of these features further increase the modem's ability to send data quickly and accurately.

V.34's "light meter" is a probing tone, a complex signal sent at the start of each connection that tells the two modems the precise characteristics of the circuit. The modems trade this information and negotiate how they will deal with any problems discovered by the test, just as a photographer studies the situation before setting up his equipment. V.34 is the first international standard modulation method to include a comprehensive test as an integral part of making a call.

Don't think that fax has been left out. The V.34 designers incorporated all the hooks that fax designers need to use the new protocol to send wire

photos at an even faster rate, and with fewer errors. V.34-based fax won't be twice as fast as V.17-based (14.4 Kbps) fax—unless the fax-standards people make radical changes to the existing fax protocols.

As standard, V.34 modems include V.42 error control, V.42bis compression, and support for all those slower-speed standards the V.32bis modems support. As V.34 products mature, watch for 28.8-Kbps fax, voice capability, automatic detection of voice/fax/data, and support for combined voice/data, such as the Radish product provides (See "Modems Find Their Voice").

And what of pricing? The wars have already started, and you are the winner.

So, in a snapshot, V.34 is more than just faster data. It's more accurate data, too, because the modems do a much better job of fitting the signaling to the line than any fixed-signaling modem like V.32bis ever could. That's one promise you can take to the Fotomat. □

data compression, caller ID, and distinctive ring support. The Plus models also offer remote configuration, in which the local modem reconfigures the remote modem and reconnects at the new configuration.

In addition, despite their moderate compression components, the U-1496 Plus and U-1496E Plus performed as well as some modems with higher DTE speeds in unidirectional performance tests on text, executable, and noncompressible files. In the Telephone Network Simulation tests, the Plus modems did well, but the U-1496E did not maintain full-speed connection over most of the network model.

The U-1496 Plus and U-1496E Plus are best suited for business installations, such as LAN-to-LAN bridging and remote access—especially the U-1496 Plus, with its LCD. The U-1496E, a good option for desktops, is similar to the Plus models in features and functionality, but the higher-end units have faster processors and more memory space. (The U-1496E has a maximum speed of 16.8 Kbps; the U-1496 Plus

and U-1496E Plus run at up to 19.2 Kbps.)

All three have LEDs and provide for 2-wire dial-up. The U-1496 Plus has 2- or 4-wire leased-line support as well as an LCD display and front-panel menu controls. All

*One outstanding
feature of the ZyXEL
modems is their voice-
mail system, which
records messages.*

models support asynchronous and synchronous communications protocols.

The security function can store passwords for one supervisor and up to 10 users. Automatic callback also provides for higher levels of security. Only the U-1496 Plus is able to activate remote configuration from an LCD panel.

The ZyXEL modems can distinguish

up to four different ring signals and can be set up to answer (or not answer) any or all of them. Another outstanding feature is the voice mail system, which works with the bundled ZFAX with Voice Software. The modems can digitize and record incoming voice messages for the computer to store as files. Voice messages can be sent to a remote location, played back, and converted to other formats.

All three modems support Group 3 send-and-receive fax mode, offering the most popular 14.4 Kbps for the highest fax speed using V.17 protocol. Both Class 2 and the Extended FAX AT command sets are supported. The ZyXEL manuals are thorough. They do, however, include some confusing statements, and they would benefit from an index.—Amy Leung □

► **ZyXEL U-1496 Plus.** List price: \$749.
ZyXEL U-1496E. List price: \$349.
ZyXEL U-1496E Plus. List price: \$499.
ZyXEL, 4920 E. La Palma Ave., Anaheim, CA 92807; 800-255-4101, 714-693-0808; fax, 714-693-0705.

Circle 520 on reader service card

Network Edition

First Looks

► HELP-DESK SOFTWARE

Help Desks: The Savors Behind the Scenes

We've tested five systems that offer solutions for your network problems.

By Albert R. Starck and Susann M. Rambo

Behind every good NetWare LAN is an even better help-desk support system. As a network grows, so do the number of possible problems. The culprits could be problems in the server or glitches in a user's computer hardware, configuration, applications, or connection to the network. Effective support tools are key to handling these problems.

A help-desk system is the linchpin that keeps a network running effectively. The five systems reviewed here—DKSystems' DKHelp Desk for Windows, Version 1.1; Vycor Corp.'s DP Umbrella for Windows SQL, Version 2.6; MGW America's MGW

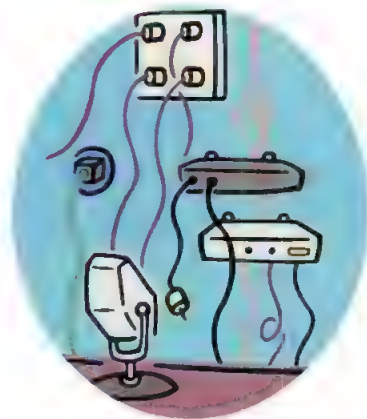
HelpDesk, Version 2.3; Magic Solutions' SupportMagic for Windows, Version 2.1; and Corporate Software's Utopia Help Desk for Windows, Version 2.01—were selected for their client/server architectures, Windows clients, and, of course, NetWare support. Each is scalable and can meet isolated help-desk needs as well as enterprise support requirements. Prices for these systems range from approximately \$12,000 to \$24,000.

Help-desk systems automate recording, diagnosis, and resolution of problems. They provide a repository of problem history and trends. Finally, they coordinate the resources needed to deal with problems. By documenting

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The latest network
products
and management
techniques



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Help-Desk Software

CONTINUED FROM NE1

the complex solutions reached by trained systems engineers, help-desk packages allow companies to shift their less-critical problems to staff members who might be less skilled.

Finding a system that does all of that isn't easy. And on top of it all, installation of each of these help-desk systems is a bear. You'll need a network engineer, a database specialist who understands the nuances of the chosen database engine, as well as a senior help-desk-support professional to handle product implementation. So be sure you're happy with the customer support a vendor offers before making a purchasing decision.

Before choosing a package, you should also ask yourself who within your organization will be using the software and for what purposes. Will it be used by just one group to track open problem calls, or will it be used across the enterprise to build and manage a central repository of problem and resolution knowledge? Keep in mind that the wider the user base, the more involved your requirements should be. The requirements of, say, a network manager and five support staff members will differ from those of field technicians. All of the people using the help desk should participate in the discussion of choosing a system.

Once you have considered who will be using these products, pay careful attention to preserving your company's technology investment. You must understand your network and the system requirements it dictates. For example, a product's database may need to comply with Microsoft's Open Database Connectivity (ODBC) specification. All of the products tested here, except for Support-Magic, provide access to Sybase and Microsoft's SQL server databases. DKHelp Desk and Utopia also feature an Oracle database option. Database support can be an important selection criterion, since most companies are looking to reduce the number of supported database engines.

Once the two most important issues—



• DP Umbrella for Windows SQL, Version 2.6

Delivering top-notch support depends on two things: access to the proper tools and access to the necessary knowledge for problem resolution.

The best problem-management systems feature open architectures and integration with widely-accepted companion products. While there were several very

strong candidates for the Network Edition Editors' Choice, Vycor Corp.'s DP Umbrella for Windows SQL, Version 2.6, edged out the other products here with its record of achieved technology interfaces and strong network connectivity tracking.

DP Umbrella smoothly manages equipment assets and network connection information. The ability to trace wire-path links between equipment and specific jacks and LAN addresses is one of the software's strong points. Version 2.6 also includes predefined support task selections that control the data dealing with changes in equipment assignees, physical locations, and connections.

Seamless links between DP Umbrella's Expertise Viewer and Inference Corp.'s CasePoint, a case-based reasoning product, deliver knowledge to the help-desk analyst when needed and create a base that can be searched at a later date when similar problems occur. Support for

SQL standard, open back-end databases translates into easy data reporting using a variety of third-party report writers.

Problem calls are placed in a call queue for display by the next available operator. This can be done either electronically when DP Umbrella is interfaced to a phone automatic call distribution (ACD) system or with incoming e-mail. DP Umbrella makes great use of e-mail for both inbound and outbound communications with the support center.

Each product performs best when its strengths match the organization's requirements. All of the products tested here have something special to offer. While Magic Solutions' SupportMagic provides more productivity features than any other product reviewed, it is limited to Btrieve database products. When SupportMagic offers compatibility with Sybase, Oracle, and other enterprise databases, it will be tough to beat.

When choosing a help-desk system, ask yourself who in the organization will be using it and for what purposes.

compatibility and database access—are resolved, you will need to determine the most important functions you expect your system to perform. We tested each prod-

uct in five key areas.

The first area we considered was problem management—the routine but critical functions dealing with the capture of problem information and the provision of the basic tools necessary for support analysts to manage and track problems to resolution. Each of the products we tested can log problem calls, display the history of a user's problems, classify types of problems, and route problems to second-level or advanced support teams. But the effi-

Continues on page NE6

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Help-Desk Software

CONTINUED FROM NE4

ciency of performing these tasks varied. We found that DP Umbrella, MGW HelpDesk, and SupportMagic stood out in this task area.

Next we looked at asset tracking. For anyone supporting users in a LAN environment, having immediate access to user information such as hardware and software configurations, LAN addresses, and network connectivity can greatly facilitate the troubleshooting process. The importance of asset tracking is evidenced by the fact that all of the products are strong in this area.

DKHelp Desk provides a simple point-and-click capability for reassigning equipment configurations to different users. Utopia displays complete equipment-repair histories without having to generate a report.

The ability to receive data from network audit utilities (such as PC Census) to populate asset databases has become a standard feature. Most vendors are moving toward compliance with the Desktop Management Interface (DMI) standard (a protocol-independent management interface), spearheaded by Hewlett-Packard Co., Intel Corp., and others.

How a product handles information regarding problem symptoms and reso-

■ A Process for Purchasing Help-Desk Software

- ① Form a project team responsible for selection. Make sure that you represent all areas of the enterprise.
- ② Define project parameters. Establish a budget, scope, and time frame for the project.
- ③ Develop technical, qualitative, and functional requirements.
- ④ Prioritize requirements. Produce a decision-criteria matrix.
- ⑤ Conduct market analysis. Identify candidates that meet your essential requirements.
- ⑥ Conduct a comparative analysis. Review product literature and consult vendors to discuss products.
- ⑦ Evaluate the products that you are considering through hands-on testing, telephone demos, or on-site vendor walk-throughs.
- ⑧ Assign performance scores on the criteria listed in the matrix. Calculate an overall weighted score for each product.
- ⑨ Select a product.
- ⑩ Present your results and recommendations to the project team for approval.

lutions is becoming increasingly important. As support staffs' responsibilities increase and more users demand faster problem resolution, it is crucial that information be readily available. Capturing and retrieving knowledge is critical. These systems offer exceptional retrieval tools for digging up prior problem resolutions that are similar to the situation at hand. They let users hierarchically organize prior problem histories. This typically includes organizing problem categories and subcategories, problem symptoms, and problem information based on product types. Various retrieval methods are available in these

products, such as symptom and resolution lookups and text and keyword searches.

More abstract queries are possible using a technique called case-based reasoning (CBR). None of the products reviewed here offer a proprietary CBR capability, but some do contain interfaces with third-party CBR software. DP Umbrella and MGW HelpDesk, for example, each offer a virtually seamless interface with Inference Corp.'s Case-Point. When additional help finding a resolution is needed, the problem description and symptoms are automat-

Continues on page NE10

Suitability to Task: Help-Desk Software

We identified five key areas that define a help-desk system's functionality and ability to integrate technology interfaces.

Problem management Most of a support analyst's time is spent in this area, making it the most important category. We assess each product's ease of use and look at its features for expediting the repetitive tasks of logging, referring, escalating, and tracking problems. We also evaluate how well a system can retrieve caller information and problem histories, classify problems, and sort problems based on status and pending actions.

Asset tracking Network information should reside within a central system and be easily acces-

SUITABILITY TO TASK	
Problem management	POOR
Asset tracking	FAIR
Knowledge capture	GOOD
Reporting	EXCELLENT
Technology interfaces	EXCELLENT

Knowledge capture and management As support services become consolidated and support calls become more "how to" in nature, the accumulation of support knowledge and the handling of prior solutions become key to providing a higher percentage of first-call resolutions. We look at each of the systems' features for organizing, relating, and retrieving prior symptoms and problem resolutions.

sible. We rate each system for its ability to track and quickly access user configurations for hardware and software components, network information, and warranty and maintenance data.

We also rate their interfaces to off-the-shelf knowledge bases.

Reporting A support group must be able to report on problem types, frequencies, trends, and cost implications so that it can provide valuable IT resource-utilization information. We evaluate each package's standard reports for content and quality, and we consider report-writer features and support for the SQL interface standard.

Technology interfaces The future of network support lies in automating the detection of problems, streamlining the delivery of solutions, and providing self-help systems for users. We look at each product's ability to interface to a variety of network management tools, e-mail systems, and telephone technologies, which include automatic call distributors, interactive voice-response systems, and fax services.

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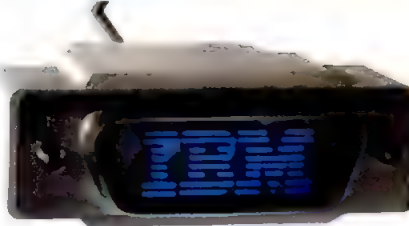


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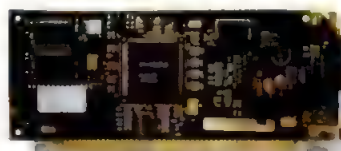


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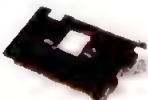


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		LAN Adapter for Ethernet (Combination)	48G7169 108
		LAN Adapter/A for Ethernet (MCA Combination)	48G7171 206
		EtherStream™ MC 32 Adapter	74G0830 558
		Dual EtherStream MC 32 Adapter	73G7136 1,060
	Token-Ring	Token-Ring Network Adapter 16/4 ISA-16	73G2032 408
		Token-Ring Network 16/4 Adapter/A	74F9410 483
		16/4 Busmaster EISA Adapter	63F0412 370
		Token-Ring Network 16/4 Adapter II	03F0215 408
		Auto LANStream™ MC 32 Adapter	60G1592 718
		LANStream MC 16 Adapter	74G0801 483
	PCMCIA	Dual LANStream MC 32 Adapter	73G7137 1,363
		Token-Ring Credit Card Adapter II	09G3931 408
		Ethernet Credit Card Adapter II (10Base2)	09G4330 225
		Ethernet Credit Card Adapter II (10BaseT)	09G4331 211
		3270 Emulation Credit Card Adapter	09G3315 464

Hubs, Bridges, Switches & Remote LAN Access			
	Token-Ring	8228	6091014 \$ 486
		8230*	
		Model 1	53F5500 1,613
		Model 2	33G4388 1,875
		Model 3	59G7719 1,975
		Model 13	59G7727 2,505
		8229 LAN Bridge (Token-Ring to Token-Ring)*	73G4761 2,622
		8235 DIALS Server for Token-Ring (Model 1)	73G3665 3,150
	Ethernet	8222	60G0625 259
		8224-Unmanaged	73G9750 822
		8224-Managed	73G9760 1,497
		8229 LAN Bridge (Token-Ring to Ethernet)*	73G4770 2,622
		8271 EtherStream Switch	92G8532 3,600
		8235 DIALS Server for Ethernet (Model 2)	73G3666 2,442

*Prices shown are for base units only. Required additional modules priced separately.

Communications Software			
IBM Netware 3.12	5 Users (3.5")	74G1621	Call for latest price!
	10 Users (3.5")	74G1623	Call for latest price!
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Help-Desk Software

CONTINUED FROM NE6

ically passed over to CasePoint, which performs CBR. If a solution is found, the corrective actions are displayed, and the resolution is sent back to the help-desk system. The knowledge in the CBR products must be designed by the help-desk staff, or canned knowledge can be purchased from third-party vendors such as ServiceWare.

An often overlooked function of these products is their ability to report on data collected. This may not be the most important task area, but a product's efficiency in it can make or break a help desk. While justifying support resources may help keep the budget ax from falling, uncovering the costs of recurring system and product failures is a real value-added benefit in itself.

We found that the systems here offer standard, preformatted reports such as breakdowns of call types and problem types. Most important, each of the pack-

ages supports report writers found in off-the-shelf products such as Microsoft Access. DKHelp Desk, for example, uses a runtime version of Computer Associates International's CA-RET, and DP Umbrella uses Powersoft Corp.'s PowerViewer.

If yours is like most support organiza-

The ability to report on data collected may not seem to be the most important feature, but it can often make or break the help desk.

tions today, it is probably being asked to do more with less. Demand for support has risen sharply, but staff levels have either remained flat or dropped. For this reason, the future of support rests in a user's ability to interface a help-desk sys-

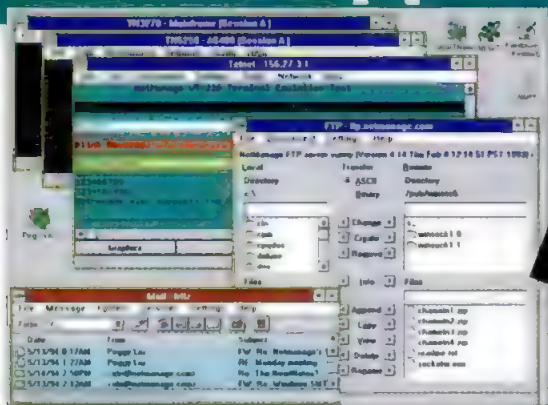
tem with complementary support tools, taking advantage of broadening open-system standards that facilitate technology interfaces.

The products here interface to e-mail systems such as Lotus Development Corp.'s cc:Mail and Microsoft Mail. The degree of integration ranges from routing action requests and notes to automatically logging problems sent to the help desk via e-mail. In addition, the products offered some sort of support for other technology interfaces, including network management tools, automatic call distributors (ACDs), interactive voice response (IVR) systems, and fax services. We found that DP Umbrella offers the broadest range of interfaces.

There are many factors involved in selecting the best help-desk system for your network. Understanding your current and future environment and your system requirements is imperative. That information, coupled with the buying

Continues on page NE12

TCP/IP Applications for Windows



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Help-Desk Software

CONTINUED FROM NE10

advice provided above, should help you make a buying decision suited to your needs.

DKSystems Inc.

• DKHelp Desk for Windows, Version 1.1

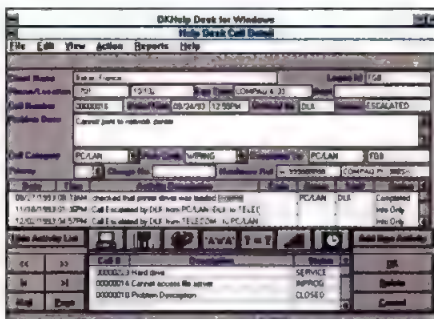
DKHelp Desk for Windows, Version 1.1, from DKSystems, a relative newcomer to the help-desk market, can best be described as intuitive and easy to use. For this review, we tested DKHelp Desk in conjunction with DKInventory Manager for Windows (a separate module). The two applications work well together.

DKHelp Desk simplifies problem management through a unique feature that relates numerous callers to a single problem incident. Once the initial problem is logged, you can link additional callers to the problem by clicking and calling up names from a displayed list. This eliminates the time-consuming task of creating multiple problem logs for each caller.

Asset tracking, or more specifically inventory, is one of DKHelp Desk's strongest areas. DKInventory maintains hardware and software information.

Tracking component and subcomponent relationships is easy. Reassigning equipment is quickly accomplished by double-clicking on the new assignee's name. Repair histories for each configuration item are easily maintained. DKInventory provides the ability to link network components and trace connectivity from the server to the component level.

Knowledge capture and management



CALL DETAIL: Information about a call is clearly represented in DKHelp Desk for Windows.

is accomplished using several methods for diagnosing problems. One method involves keyword or text lookups based on the problem-description field. Only single words or short phrases are feasible, since the system does not provide Boolean searches. Another method involves retrieving problems that have

► FACT FILE

DKHelp Desk for Windows, Version 1.1

List price: For 10 users, \$12,495 (includes DKInventory Manager for Windows). **In short:** Although not as full-featured as some of the other products reviewed, DKHelp Desk is easy to learn and use. A particular strength is its integrated inventory and asset-management function. Future releases of the product will include interfaces to third-party

knowledge bases and Shary's AlertView application-monitoring software

DKSystems Inc., 444 N. Michigan Ave., Chicago, IL 60611; 800-892-5332, 312-644-2700; fax, 312-644-2703.

900 on reader service card

SUITABILITY TO TASK	
Problem management	GOOD
Asset tracking	EXCELLENT
Knowledge capture	FAIR
Reporting	GOOD
Technology interfaces	FAIR

like entries in the problem-category and problem-type fields. The solution steps can be viewed by clicking on a stair-step icon button.

For reporting, DKSystems ships a runtime version of CA-RET from Computer Associates International. This interface provides a good selection of standard reports, all of which can be customized and viewed on the screen prior to printing.

Continues on page NE14

• Network Management Integration Opportunities

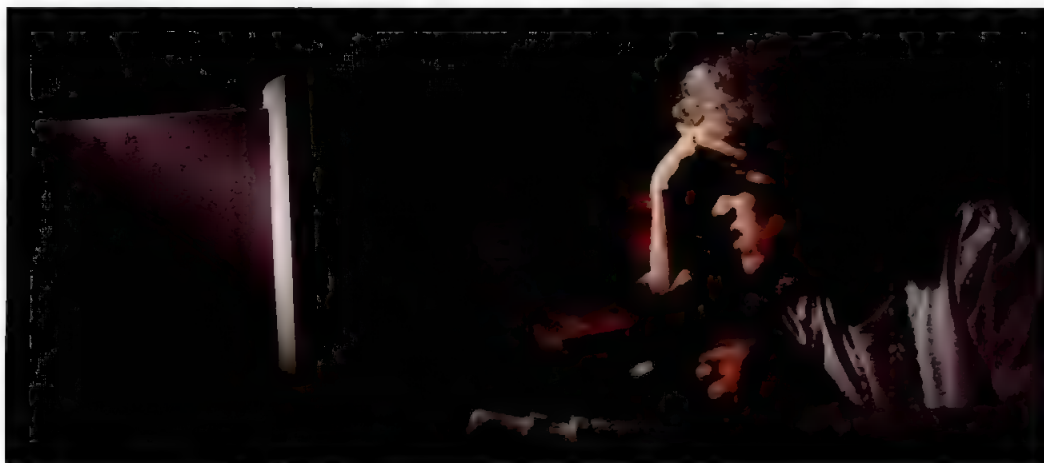
New technology applications, distributed computing, and desktop applications are drastically increasing the type and volume of problems reported to system support groups. But with downsizing and budget cuts, it's unlikely that senior management will increase the support staff. One viable strategy is to link the help-desk system with network management systems and monitoring devices. Ideally, the enterprise network-management system should detect a problem, automatically attempt to resolve it, record the event, and route appropriate information to the problem-management system. This proactive strategy can reduce staff work load and minimize the outages responsible for productivity and business losses.

Vendors are taking varied approaches to provide assistance in managing IT (information technology) resources. Several products integrate with help-desk systems (or have embedded help-desk functions) to increase productivity and lower costs.

Command/Post from Boole & Babbage (800-222-6653) monitors a wide array of multivendor components, including installed or legacy systems, client/server applications, connectivity products, and telecommunications and wireless systems. Its **AutoCommand** product captures knowledge and attempts to resolve problems automatically. If it cannot resolve the problem, it notifies the help-desk system and sends a trouble ticket to the appropriate sup-

port group. **Netscout Resource Manager**, from Frontier Software Development (508-851-5700), monitors devices using several methods, including remote monitoring (RMON) management information base (MIB). Netscout can also be interfaced to a help-desk system. It lets network administrators define specific automatic actions in response to certain conditions.

On the network utility side, the new **LAN Support Center** software, from McAfee Associates (800-552-9876), integrates its own help-desk functions with its network products—**LAN Automatic Inventory**, **NETremote+** (which assumes control of a remote workstation to resolve problems), and **SiteMeter** for software metering.



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Help-Desk Software

CONTINUED FROM NE12

DKHelp Desk interfaces with Microsoft Mail and WordPerfect Office mail. Future releases will support the Vendor Independent Messaging (VIM) standard.

While DKHelp Desk is not as feature-intensive as the other products we reviewed, it can be applauded for its asset-tracking capabilities, as well as a crisp, uncluttered interface. Overall, the product is an easy-to-use solution for the help desk.

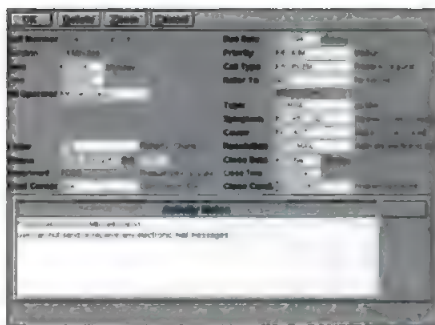
NETWORK EDITION

EDITORS' CHOICE

Vycor Corp.

• DP Umbrella for Windows SQL, Version 2.6

Vycor Corp. was one of the first companies to produce a help-desk product for the client/server environment, and Version 2.6 of DP Umbrella for Windows SQL adds on support for Sybase System



WHAT'S THE PROBLEM? DP Umbrella's main activity window tracks pertinent information.

10 and Inference Corp.'s CasePoint case-based reasoning software. DP Umbrella also excels in its support for technology interfaces, including phone ACD systems, network utilities, and e-mail systems.

DP Umbrella's e-mail interface is tightly coupled to problem management, more specifically problem escalation. Based on the problem priority and a target-resolution time-frame calibrated in minutes, hours, or days, unresolved problems are automatically escalated to other

designated resources, and an e-mail message is sent to the help desk. All of this is done without staff intervention.

A strength of DP Umbrella is asset and network-connectivity management. Equipment configurations can be broken down into components and subcomponents, linked to users and locations, and traced to specific jacks and LAN addresses. When actions are assigned to resolve problems or move or repair equipment, predefined screens prompt the user for the information needed to update data tables.

The product features an expertise builder and viewer capability for knowledge capture and management. With this feature, the help desk creates problem topics with symptoms, causes, and resolutions. Each area can be searched to offer a reasonable troubleshooting starting point. The limitation is that you must first classify the problem by a topic before beginning the search.

Although Version 2.6 does not have a good variety of preformatted reports, DP

Continues on page NE18

KING AMONG PEERS

POWERLan 3.0: The Most POWERful Peer-to-Peer LAN Operating System

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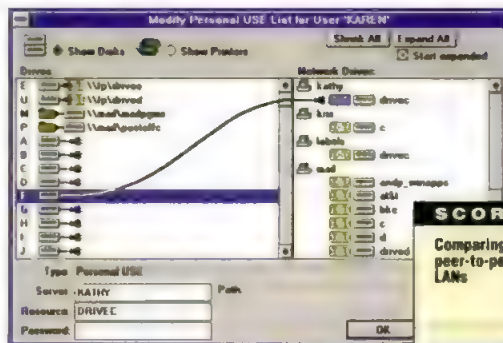
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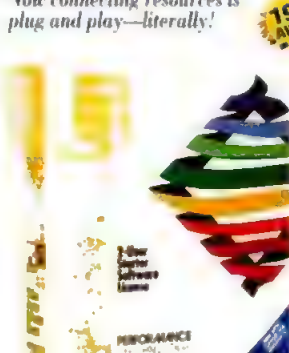


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PC Week
February 7, 1994

SCOREBOARD				
Comparing peer-to-peer LANs	PCWEEK LABS REVIEW	Artisoft Inc. Simply LANtastic 5.1	Microsoft Corp. Windows for Workgroups 3.11	Novell Inc. NetWare 3.11
PCWEEK LABS Overall score		3.2	3.5	3.5
				4.0



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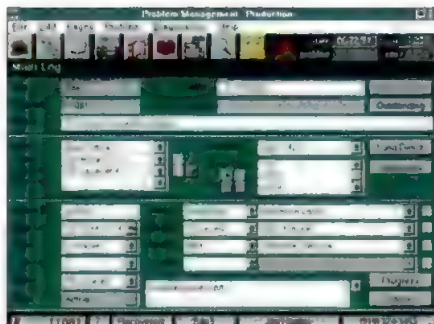
CONTINUED FROM NE14

Umbrella ships with Powersoft Corp.'s PowerViewer and easily interfaces with other ad hoc report writers like Microsoft Access and Trinzic Corp.'s Forest and Trees.

When a problem is closed in DP Umbrella, the person who originated the problem is notified automatically via e-mail. Resolution information and helpful

programs like Microsoft Access, Inference Corp.'s case-based reasoning software—CasePoint, and Folio Corp.'s Folio Views document-management software.

There are many ease-of-use features to aid you with problem management.



PROBLEM GROUPING: MGVS HelpDesk groups related data into three regions.

You're never more than a single mouse-click away from the main problem-log screen. A status line across the bottom of the screen maintains problem number and status and caller's name and phone number for reference. Numerous drop-down lists on data-entry fields offer quick access to valid data. Profile icons next to certain fields let you drill down for additional details on topics such as equipment, assignment groups, individuals, and vendors.

MGV HelpDesk, like the other products in this roundup, makes use of component, subcomponent, and feature relationships to allow help desks to set up and track asset information. Integrating PC Galaxy, from Apsilog, allows worksta-

tion and network audit data to be directly loaded into MGVS HelpDesk's databases.

Knowledge capture and management is assisted by the inclusion of Folio Views. With Folio Views, support personnel can easily retrieve the right information from a context-sensitive document-management system. MGVS HelpDesk also manages the access to prior symptom and resolution information exceptionally well, with links to products and topics the help desk supports. MGVS HelpDesk can pass problem description and symptom information to CasePoint and return with resolutions. Other interfaces, such as automatic logging of problems, have not yet been achieved.

All reporting is provided via Microsoft Access. MGVS HelpDesk ships with approximately two-dozen preformatted reports.

MGV HelpDesk is exceptionally strong in the areas of problem management, asset tracking, knowledge capture and management, and reporting. It is both internally and externally (with its smooth integration of third-party products) feature-rich. Perhaps its only weakness is that it is lacking in its support for technology interfaces.

Magic Solutions Inc.

• SupportMagic for Windows, Version 2.1

Magic Solutions' new SupportMagic for Windows is by far the most feature-rich product we reviewed. This latest release is tighter and brings true Microsoft Windows' Messaging Application Programming Interface (MAPI) compatibility. SupportMagic offers a lot of built-in system customization, productivity, and operator preference options.

Novell's Btrieve, available as a NetWare Loadable Module (NLM), gives SupportMagic its client/server characteristics. It doesn't support independent databases such as Microsoft SQL Server for NT and Sybase SQL Server for NetWare. If it had broader database compatibility and a stronger record of achieved technology interfaces, it could have been the Network Edition Editors' Choice.

This product offers extremely customizable problem-escalation rules for problem management. In addition to

Continues on page NE24

▶ FACT FILE

DP Umbrella for Windows SQL, Version 2.6

List price: For 10 users, \$11,995 **In short:** DP Umbrella makes excellent use of e-mail to route problem referrals and status notifications automatically. Managing network and system components and connectivity information is a unique strength. Expanded network management interfaces are planned, including integration to Microsoft Corp.'s Systems Management Server (formerly Hermes), a network and systems-management tool.

Vycor Corp., 5411 Benwyn Rd., College Park, MD 20740; 301-220-4454, 800-888-9267; fax, 301-220-0727.

969 on reader service card

SUITABILITY TO TASK	
Problem management	EXCELLENT
Asset tracking	EXCELLENT
Knowledge capture	EXCELLENT
Reporting	FAIR
Technology interfaces	EXCELLENT

comments can be added to the message, thus providing a form of user training during the support interaction.

DP Umbrella is an all-around strong product with excellent e-mail integration and network management. With its planned integration with Microsoft's Systems Management Server (formerly Hermes), a network- and systems-management tool, Vycor's offering should only become more attractive.

MGV America Inc.

• MGVS HelpDesk, Version 2.3

MGV America's MGVS HelpDesk, Version 2.3, offers expanded asset tracking and service-level management. This latest well-designed version of MGVS HelpDesk offers an open architecture, fully exploiting third-party-product features through seamless integration with

▶ FACT FILE

MGVS HelpDesk, Version 2.3

List price: For 10 users, \$23,000 **In short:** The strength of MGVS HelpDesk lies in its open system design and breadth of tools (internal and external), through the tight integration of third-party products. The seamless interface to Folio Views alone can provide a wealth of knowledge to the help desk. This is a robust product with a surprisingly comfortable learning curve.

MGV America Inc., 900 Ridgefield Dr., Suite 130, Raleigh, NC 27609, 919-790-8211; fax, 919-790-8214.

968 on reader service card

SUITABILITY TO TASK	
Problem management	EXCELLENT
Asset tracking	EXCELLENT
Knowledge capture	EXCELLENT
Reporting	EXCELLENT
Technology interfaces	FAIR

Conner's CR6-RAID delivers
a lower cost per MB than
mirroring and duplexing...

Conner's CR6-RAID. The first full featured RAID level 5 system that delivers fast, fault-tolerant access to mission critical data. With over 36 million disk drives shipped to date, you can count on Conner for reliability, performance and superior technical expertise.

Conner delivers more features for your money.

Features	Conner CR6-RAID	Mirroring/Duplexing
Fault tolerant capacity	5.0 GB	5.0 GB
User definable rebuild	YES	NO
Includes SCSI host adapter and cable	YES	NO
Remote Array Management GUI	YES	NO
Hot spare capable	YES	NO
Hot swap drives	YES	NO
List price	\$10,995	\$14,500
Cost per MB	\$2.19	\$2.90

So access your data with Conner—the
Storage Solutions Company. Call your

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order or call Conner
Storage Systems at
1-800-755-0535
for more

information on our full line
of tape drives, disk drives and
disk array products.



...as well as a FREE
uninterrupted power
supply. A \$279 value.*

Conner offers more than the competition.

Features	Conner CR6-RAID	Storage Dimensions Continua	Micropolis Raidion LT
Bootable (does not require separate boot device)	✓	✓	
Hot spare	✓		✓
User definable rebuild	✓		
Windows NT certified	✓		✓
Includes SCSI host adapter and cable	✓		
Remote Array Management GUI	✓		

CONNER.
The Storage Answer.

*CR6-RAID must be purchased between 6/1/94-9/15/94
Proof of purchase and serial number registration required
Conner Storage Systems, Lake Mary, FL (407) 263-3900 ©1994 Conner Peripherals Inc
All trademarks or registered trademarks are property of their respective owners

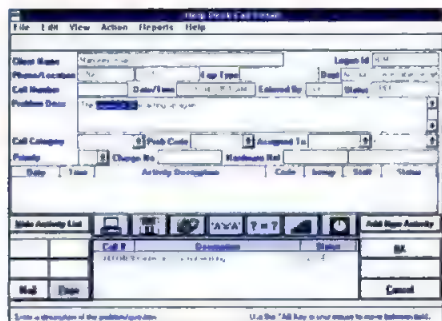
CIRCLE 948 ON READER SERVICE CARD

Headache Relief: *Three Steps to Solving a Help-Desk Problem*

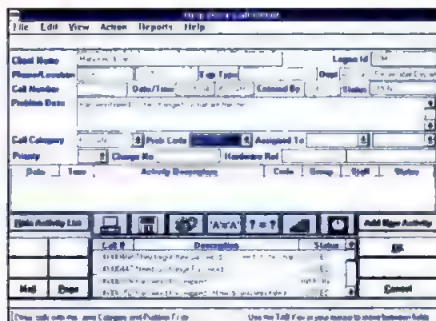
By Vicki B. Jacobson

Wondering how easy these help-desk products are to use? Read on. Below are the critical steps you'll go through when troubleshooting an incoming call with these packages. Most packages help you identify the key information for solving a problem. All the packages then let you search for the critical information from historical data and import that data to solve the current problem.

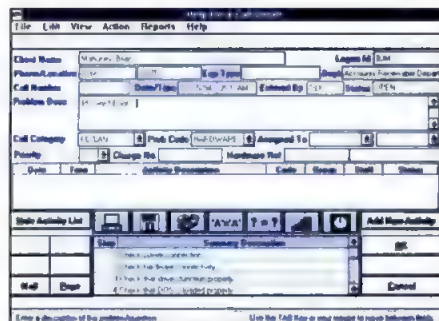
DKHelp Desk for Windows, Version 1.1



Highlight keywords within the problem description to find past calls.

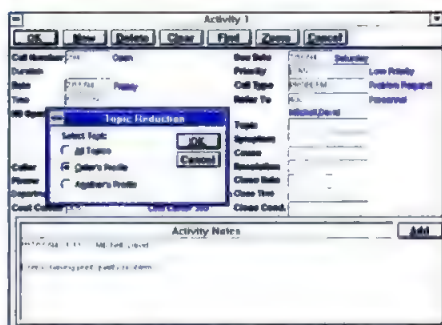


Other related calls can be located by searching on the Problem Code.

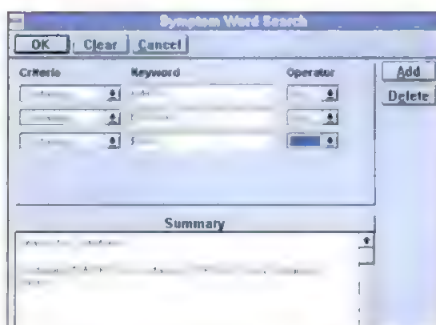


DKHelp Desk then displays predefined steps for solving a problem.

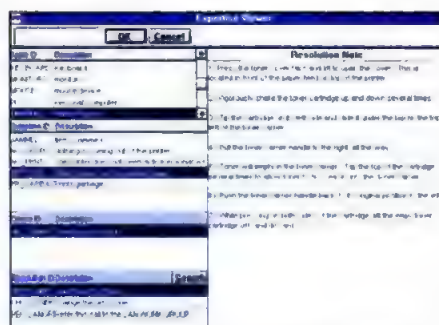
DP Umbrella for Windows SQL, Version 2.6



First, identify a problem's topic, symptom, cause, and resolution.



Then use the Symptom Word Search to locate past problems.



Finally, view a problem's causes, resolutions, and related notes.

Continues on page NE22

Wouldn't it be nice if everything came preloaded like NetWare Ready hardware?



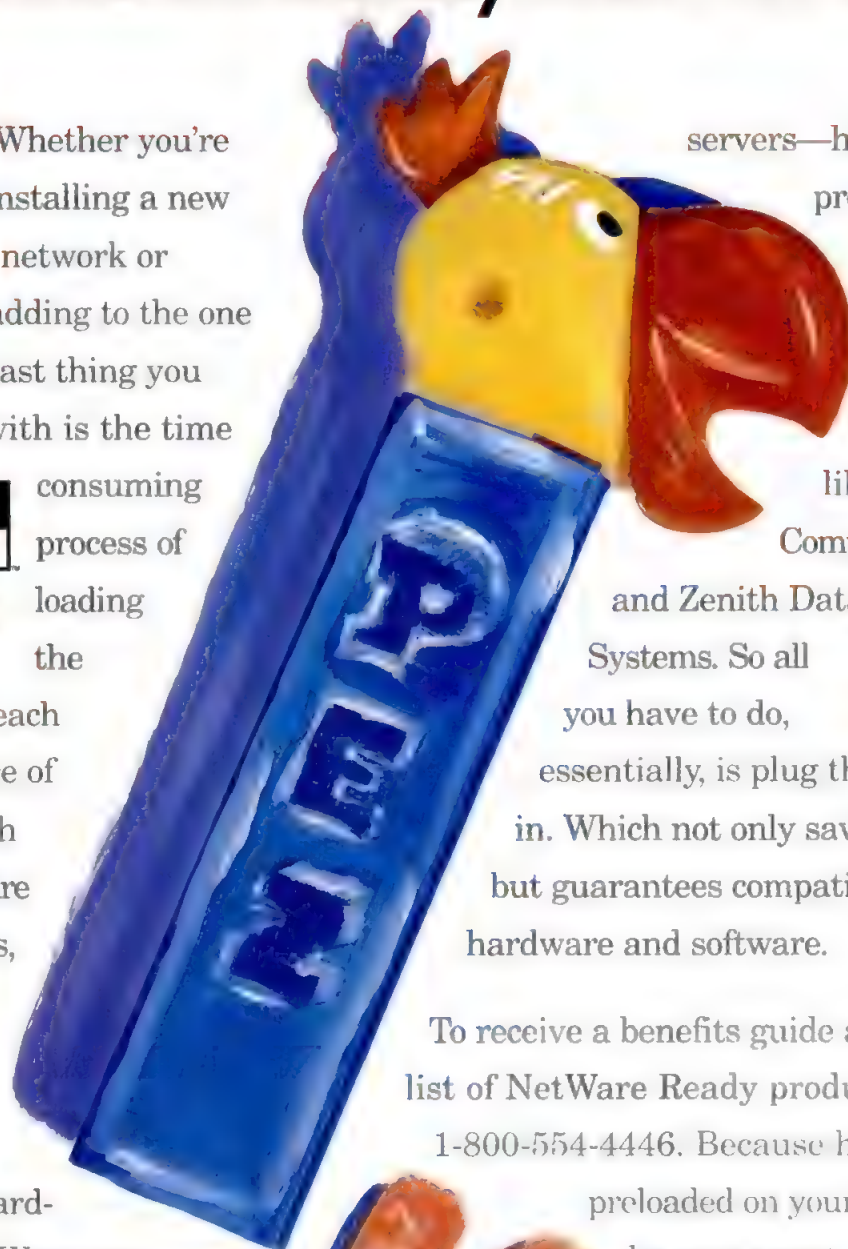
Whether you're installing a new network or adding to the one you have, the last thing you want to deal with is the time



NetWare Ready products are tested and approved for compatibility and quality by Novell.

consuming process of loading the software onto each individual piece of hardware. With Novell's NetWare Ready products, you no longer have to.

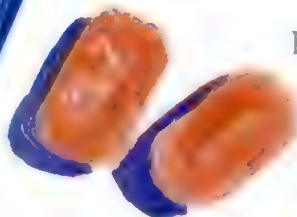
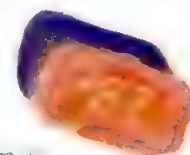
Because now you can buy hardware with NetWare pre-installed on both clients and



servers—hardware from proven manufacturers with names you know by heart. Names like 3Com, Compaq, Dell, IBM,

and Zenith Data Systems. So all you have to do, essentially, is plug things in. Which not only saves you time, but guarantees compatibility between hardware and software.

To receive a benefits guide and complete list of NetWare Ready products, just call 1-800-554-4446. Because having NetWare preloaded on your hardware can be very sweet indeed.



NOVELL. The Past, Present, and Future of Network Computing.

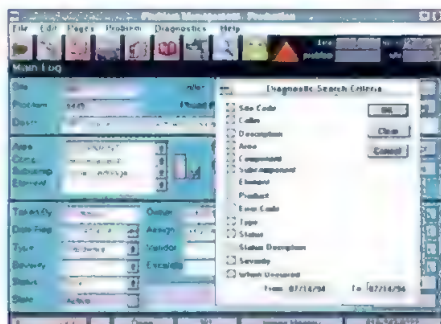
CIRCLE 890 ON READER SERVICE CARD

All brand and company/product names are trademarks or registered trademarks of their respective companies.

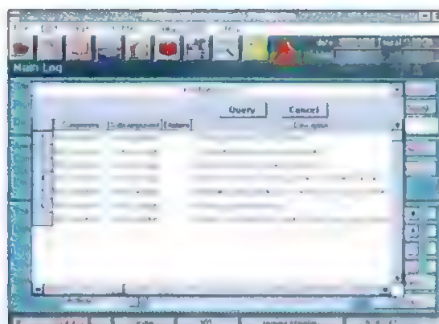


▪ Headache Relief (continued)

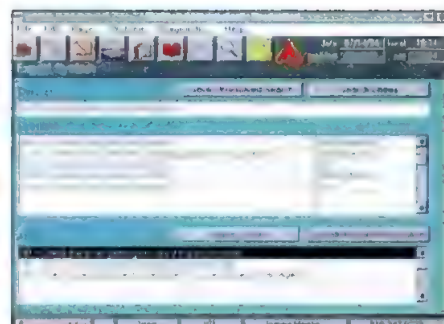
MGV HelpDesk, Version 2.3



Locate resolved problems through the Diagnostic Search Criteria box.

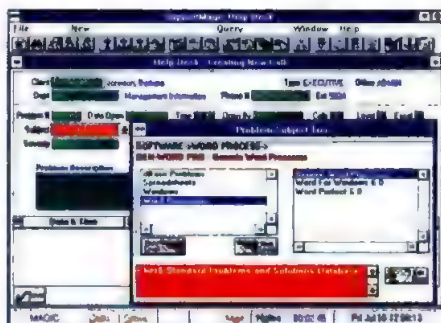


The Problem List then displays these search results sorted by date.



View the possible problem resolutions and descriptions in the Expert System tool.

SupportMagic for Windows, Version 2.1



Log the problem and search parameters in the Problem Subject Tree.

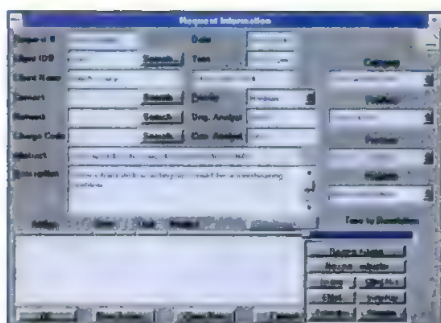


Retrieve past problem descriptions and past problem resolutions.

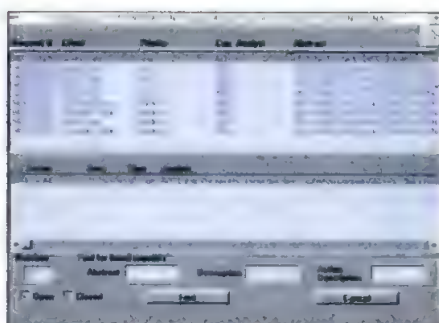


You can then enter current problem specifics in the Closing Call window.

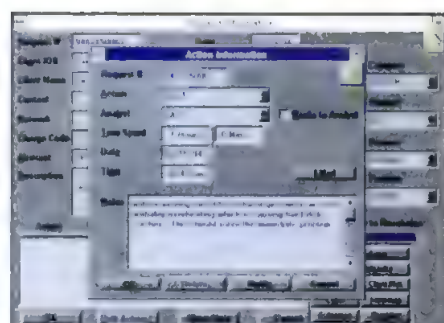
Utopia Help Desk for Windows, Version 2.01



Identify the problem using the category, product, and process fields.

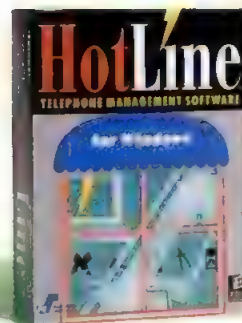


Search this information for past requests that might help solve the problem.



The Action Information screen then registers the advice for problem resolution.

If your
business
relies primarily
on  contact,
you need a
telephone with
a  or headset
and a keypad, a
shelf full of ,
a  or business
card file, something
to jot down  on
and, quite possibly,
a  to file
them away.



Or this.

HotLine® for Windows™ is the ultimate telephone management tool. It dials. It creates user-defined phone books. It logs call information and comments. It gives you full-duplex speakerphone capabilities. It lets you call anyone, anywhere, instantly with dBase-compatible directories. Call 1-800-964-SMSI today for more information. It could be the last number you'll ever dial.

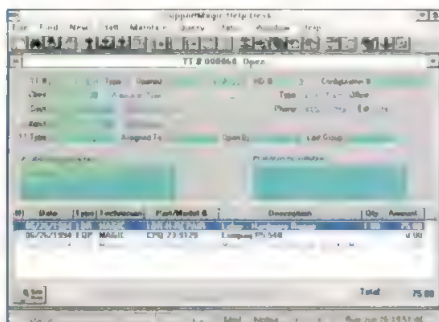
SMITHMICRO
SOFTWARE 

Help-Desk Software

CONTINUED FROM NE18

defining the recipient of escalated calls, priority levels can be set for problem types and for high-profile clients.

Asset tracking in SupportMagic gives support for purchase requests (via an add-on module), tracking of inventory supplies on trouble tickets, and detailed



TICKET WINDOWS: SupportMagic separates the activities of technicians and help-desk staff.

tracking of equipment and configuration links. SupportMagic also offers separate problem and trouble-ticket databases.

SupportMagic doesn't interface yet with any third-party knowledge bases for knowledge capture and management. It does offer query and diagnostic tools for recalling prior resolutions. The Standard Problems feature spots stored problem/resolution pairs, letting a user quickly log

Continues on page NE26

SUMMARY OF FEATURES

Help-Desk Software



Products listed in alphabetical order

■ = YES □ = NO

	DKHelp Desk for Windows, Version 1.1	DP Umbrella for Windows SQL, Version 2.6	MGV HelpDesk, Version 2.3	SupportMagic for Windows, Version 2.1	Utopia Help Desk for Windows, Version 2.61
List price	\$12,495 (10 users)	\$11,995 (10 users)	\$23,000 (10 users)	\$11,495 (12 users)	\$24,090 (10 users)
Database compatibility	DB2, Oracle, Quadbase, SQL Server, Sybase	SQL Server, Sybase	DB2, SQL Server, Sybase	NetWare Btrieve (NLM)	Oracle, SQL Server, Sybase
Problem Management					
Summary/detailed problem descriptions	■	■	■	■	■
Activity notes	■	■	■	■	■
Multiple problem-status views	■	■	■	■	■
Caller problem histories	■	■	■	■	■
Problem-referral tables	■	■	■	■	■
Automatic problem escalation	■	■	■	■	■
Problem-severity tables	□	□	■	■	□
Problem-priority tables	■	■	■	■	■
Multiple problem-classification levels	■	■	■	■	■
On-line help and documentation	■	■	■	■	■
Asset Tracking					
Equipment configurations linked to users	■	■	■	■	■
Component and subcomponent breakdown	■	■	■	■	■
On-line problem and repair histories	■	□	□	□	■
Warranty and maintenance tracking	■	■	■	■	■
NIC and LAN address identification	■	■	□	■	■
Wire-path and connectivity tracking	■	■	□	□	□
Knowledge Capture and Management					
Hierarchical/case knowledge-capture methodology	■	■	■	■	■
Symptom and resolution lookups	■	■	■	■	■
Text retrieval and keyword searches	■	■	■	■	■
Image retrieval	□	■	■	■	■
Interfaces with third-party knowledge-bases	□	■	■	□	■
Reporting					
Preformatted reports	■	■	■	■	■
Query by example	□	□	■	■	■
Included/third-party ad hoc report writer	■	■	□	□	□
Formatted data export	■	■	■	■	■
SQL-compliant (open back end)	■	■	■	■	■
Technology Interfaces					
Automatic problem logging via e-mail submission	■	■	□	■	□
Problem escalation with e-mail notification	■	■	■	■	□
Network utilities	□	■	■	■	■
Phone systems	□	■	□	□	□
Fax systems	□	□	□	□	■

* Third-party report writers must include ODBC drivers in order to support Btrieve

FACT FILE

SupportMagic for Windows, Version 2.1

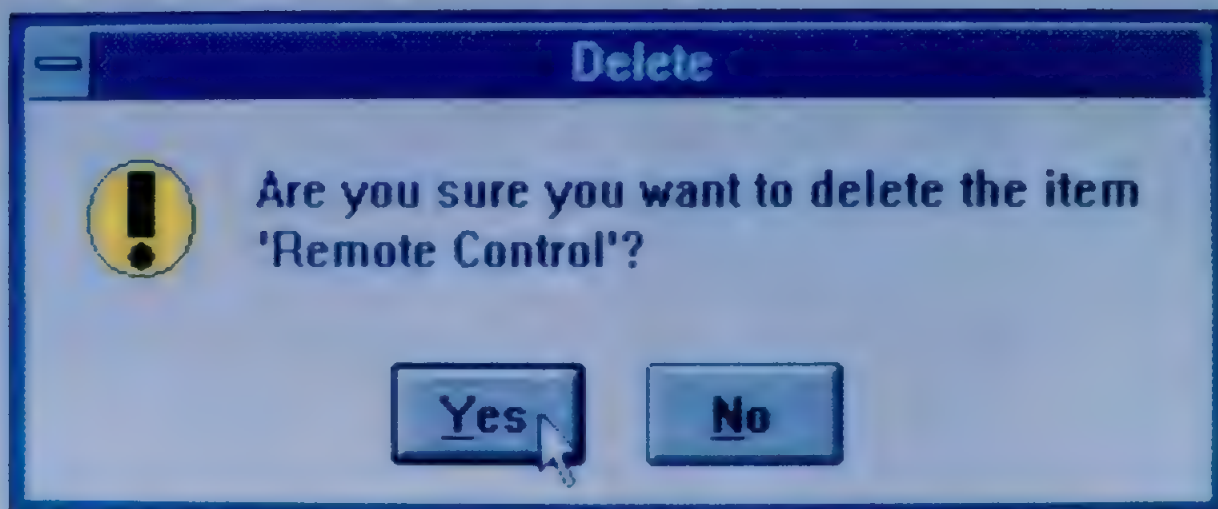
List price: For 12 users, \$11,495. **In short:** The full list of features in SupportMagic isn't just bells and whistles. Most of the features in this package can be tied to gains in productivity and efficiency. Tracking open problems and multiple trouble tickets, including inventory utilization, is a snap. Support for Sybase and Oracle database management systems, planned for later this year, will make this product hard to beat.

Magic Solutions Inc.,
180 Franklin
Turnpike, Mahwah,
NJ 07430; 201-529-
5533; fax, 201-529-
2955.

967 on reader service card

SUITABILITY TO TASK

Problem management	EXCELLENT
Asset tracking	EXCELLENT
Knowledge capture	GOOD
Reporting	EXCELLENT
Technology interfaces	GOOD



Once
you try
remote
disk,
you'll lose
control.

Remote control is a great way to access a computer by modem if there's no other option. But if you could accomplish the same thing faster and more easily, you'd probably drop it in a minute.

Which is precisely what you can do once you have HotDisk® — the amazing new remote disk software from Smith Micro for both DOS and Windows.

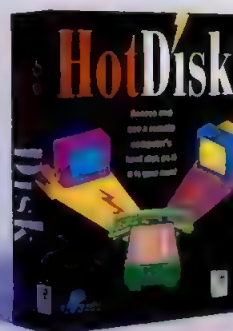
With HotDisk, you execute programs at your location while accessing up to 26 drives available to a host PC exactly as if they were on your own computer. As a result, you bypass the bottlenecks that bog down remote control and free the host to be used by somebody else because HotDisk operates invisibly in the background.

HotDisk is simple to use, too, since it utilizes all DOS commands — including the easy-to-use COPY command for transferring files — as well as convenient drag and drop Windows capabilities. And it gives you transfer speeds of 1,200 to 115,200 bps, plus password protection, host dial-back security and access rights for each user.

SMITHMICRO
SOFTWARE 

So call Smith Micro — the leader in telecommunication software — today at 1-800-964-SMSI for more information or to find out where you can get HotDisk.

It's the remote control alternative worth getting excited about.



Help-Desk Software

CONTINUED FROM 24

and close common problems.

SupportMagic ships with 250 predefined reports. A customized interface with Crystal Computer Services' custom-report writer, Crystal Reports, Version 3.0, is offered at extra cost.

SupportMagic offers support for various technology interfaces, including cc:Mail and Microsoft Mail. An internal SupportMagic e-mail system offers notification options. Clients automatically log their own problems via e-mail—a feature also in DKHelp Desk for Windows and DP Umbrella for Windows SQL. Support staff are paged via the WinBeep interface.

SupportMagic is loaded with features and functionality, all of which ensure gains in productivity. The addition of support for Sybase and Oracle database management systems (planned for the next release) will make SupportMagic hard to beat.

Corporate Software Inc.

• Utopia Help Desk for Windows, Version 2.01

Utopia Help Desk for Windows, Version 2.01, from Corporate Software, brings experience and proven support for technology interfaces and knowledge management to the help-desk, problem-management market. Utopia, the first Windows-based product to enter the arena, has changed substantially in its functionality, but not in look or feel.

Utopia addresses problem management in the form of requests, facilitated by nicely organized screens, plenty of search buttons, and an easy-to-use sort feature. Whenever record lists are displayed, clicking on a shaded sort bar above any field instantly sorts the data on that field. You can associate default work times for each support action, like install, repair, and replace, to expedite data entry. Call escalation is managed automatically by a background process constantly monitoring problem priorities.

The same fields used for categorizing problems can be used for retrieving prior resolutions. Utopia searches for matches based on entries in fields called category, product, and process. You can also execute text searches on the problem-abstract, description, and action-description fields.

We used a separate but fully integrated inventory module, Utopia Inventory for Windows, to assess the product's asset-tracking capabilities. Inventory for Windows provides thorough management of equipment assets. Utopia also provides on-screen listings of equipment-repair histories, a somewhat rare feature among help-desk systems; DKHelp Desk for Windows with DKInventory Manager for Windows is the only other product in this roundup that offers such functionality. The other products provide this function via a printed report.

Utopia has a strong collection of pre-
Continues on page NE29

Take The Hocus-Pocus Out Of Sharing Documents In Your Workgroup

[Make missing font problems disappear, no tricks, no fooling]

Somebody in your workgroup sends their beautiful presentation across the network for comments and all of a sudden, presto-chango—spaced-out headings, broken bullet points, crooked columns, and a printer that needs a miracle just to print it all out.

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Font Works for Windows. The network utility set that works like magic to wipe out font and formatting problems, forever.

When fonts are missing in a document, Font Works automatically creates screen and printer versions to match the fonts in question. So without messy viewers or bloated file sizes, every document prints quick-

ly and smoothly. Looking just the way it's supposed to. With all the applications you already own.

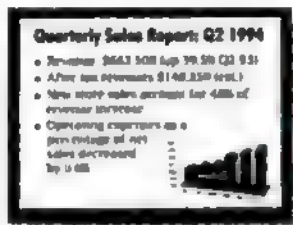
Call now and get our Workgroup Evaluation Kit that allows 10 net-

worked users to try Font Works for 60 days for only \$79.*

After you try it, we think you'll buy Font Works for the same reason you've standardized on Application Suites: Font Works is a great deal, it increases productivity, and it reduces support costs. No abracadabra. No

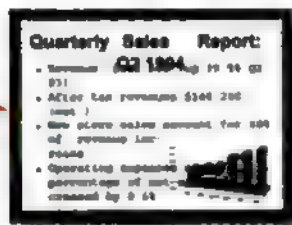
hocus-pocus.

10-USER 60-DAY
WORKGROUP EVALUATION
PACK & NETWORK WHITE
PAPER. ONLY \$79!
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Font Works you'll never worry about broken presentations or documents again.



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*Try Font Works for 60-days and if you like it, get a \$200 rebate on the 10-user license (regular price, \$400). Or, do nothing and keep a single user license for your \$79.
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If you've tried to access a corporate network from a remote office or from home, you know that operating complex applications via modem is like trying to run the 100-yard dash through waist-deep mud. Only Combinet's Everywhere Networking™ lets you access any file or application on your enterprise network through the telephone network without paying a heavy price in time or dollars. You can easily access information-intensive applications like Windows™ and imaging from any location, just as if your PC, Mac, Unix® workstation, or X-terminal was hard-wired to the enterprise network. No complex log-in procedures.

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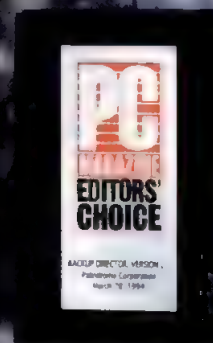
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"**Backup Director™** provides an exceptional tape management scheme, a well-designed interface, easy installation, backup and restore. It's an excellent package with high-end automation features. Our Editors' Choice"

PC MAGAZINE MARCH, 1994

Backup Director was chosen #1 from a field of 9 industry-leading products, including Cheyenne ARCserve™ 5.0 and Legato NetWorker™ 2.2



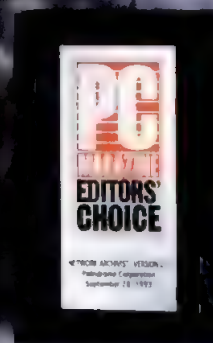
BEYOND BACKUP - IN A CLASS BY ITSELF

"Using the **Network Archivist™** is like being chauffeured around in your own limousine. Every aspect of tape and file management (including archiving and migration) is addressed."

NETWORK COMPUTING MARCH, 1994

"We looked for features paving the way for continuous storage management. **Network Archivist™** tackles the process from every angle... all handled automatically. Our Editors' Choice"

PC MAGAZINE SEPTEMBER, 1993



AND NOW INTRODUCING PALINDROME HSM...

Palindrome Hierarchical Storage Management (HSM)™ software is today's best way to manage LAN storage capacity. It eliminates "Out of Disk Space" errors, reduces the time and cost of storage expansion, migrates and recalls data to and from your choice of secondary storage devices. Of course, it's all automatic.

No reviews yet, but this new generation of software should have everybody talking.



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Palindrome software products bring intelligent automation to LAN backup and storage management. No other name in backup offers such efficiency, versatility, simplicity and safety.

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Leading the Way in Automated Storage Management



Help-Desk Software

CONTINUED FROM NE26

formatted management reports, including a query-by-example capability. All of the data can be accessed through third-party report writers.

Version 2.1 (not shipping at the time of this review) will expand the e-mail capabilities so that action notes can be forwarded

The screenshot shows a complex search interface with multiple tabs and filters. The 'Request' tab is active, showing fields for Request ID, Object ID, Requester, Network, Change Code, Address, Description, Category, Product, Priority, Assign, Category, Product, Process, Problem, Status, and Date. Below these are checkboxes for 'Open' and 'Closed'. A table at the bottom displays search results with columns for Request ID, Object ID, Requester, Network, Change Code, Address, Description, Category, Product, Priority, Assign, Category, Product, Process, Problem, Status, and Date.

THE RESULTS ARE IN: Utopia's Query Requests by Example offers multiple views of a search.

to users to track the progress of their help-desk requests. Utopia will be able to notify analysts of referrals via pager. The expert system interface will support on-screen links to text retrieval and decision-tree troubleshooting, using Mahogany Help-Desk, from Emerald Intelligence.

FACT FILE

Utopia Help Desk for Windows, Version 2.01

List price: For 10 users, \$24,090 (includes Utopia Inventory for Windows). **In short:** Utopia Help Desk for Windows provides good functionality with a straightforward user interface. The list of features isn't overwhelming, but capturing problems and resolving them is quick and easy. Version 2.1 promises to add state-of-the-art expert system capabilities, improved e-mail function, and expanded user customization.

Corporate Software Inc., 275 Dan Rd., Canton, MA 02021, 617-821-4500, fax, 617-821-5668

966 on reader service card

SUITABILITY TO TASK

Problem management	GOOD
Asset tracking	EXCELLENT
Knowledge capture	GOOD
Reporting	EXCELLENT
Technology interfaces	GOOD

Our Contributors: ALBERT R. STARCK and SUSANN M. RAMBO are managing partners of Hyperion Associates Inc., a support-services consulting firm.

► NETWORK ADMINISTRATION

NUA Saves Time, Money, and Hard Disks

BY TONY POMPILI

On a single PC, finding and correcting hard disk problems is simple. But what if you have 50 or 100 clients? Then you want Symantec Corp.'s new Norton Utilities Administrator (NUA), Version 1.0.

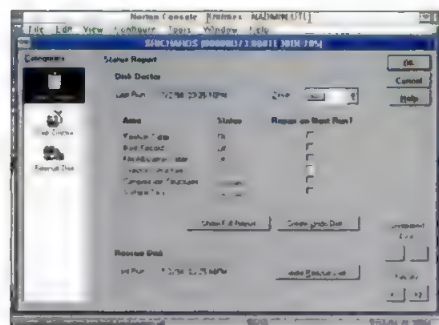
NUA (\$350 for 10 users) provides inexpensive, centralized monitoring and repair of clients' basic hard disk problems and can also help speed clients' recovery from hard disk crashes. NUA has no direct competitor that we know of, only standalone disk repair utilities like The Norton Utilities—which is actually included with NUA.

NUA comprises a central console and two separate utilities: a streamlined version of The Norton Disk Doctor—a standalone disk repair program normally included with The Norton Utilities, and Rescue—a monitoring and repair utility. NUA works with most major networks.

Because it is intended solely for maintaining client PCs' hard disks, NUA is an excellent complement to other network-administration software, such as Symantec's own The Norton Administrator for Networks (Network Edition, First Looks, December 21, 1993), that provide software metering, inventory, and other features. In fact, if you already use The Norton Administrator for Networks, you can launch NUA directly from its interface.

NUA is very easy to install and configure. The Disk Doctor and Rescue utilities run from a shared network drive, not as memory-hogging TSRs on each client. We found it helpful to include the utilities in our network log-on scripts.

Once we installed NUA, its console made client-configuration and monitoring easy. A table of clients provides each PC's network adapter ID, log-on name, and error status. From the console, you schedule how often to run each utility on your clients. Users can also run either utility from their PCs. When NUA discovers



STATUS REPORT: Norton Utilities Administrator reports and fixes clients' hard disk problems.

problems, it can either fix them automatically or just report them to you.

NUA also eliminates the need for tedious collection of client configuration files, drivers, and hardware settings. NUA automatically discovers this information and can use it to create emergency startup disks for each client.

We ran NUA on our 10-client NetWare 3.11 network. We repaired hard disk problems on several clients simply by clicking on each client's name and selecting the Fix option. After we logged each client on again, the problems were fixed.

Although NUA does report hard disk defragmentation, it provides no networked tools to fix the problem. A single-user copy of The Norton Utilities, Version 8.0, is included with NUA, but you can't run it automatically like Disk Doctor or Rescue.

NUA is also a bit limited in the way it organizes users. In a large environment, it would be nice to be able to organize clients by department or server.

Still, for \$35 per user, Norton Utilities Administrator is an excellent value and an invaluable tool for maintaining and repairing clients' hard disks across the LAN.

► Norton Utilities Administrator, Version 1.0. List price: For 10 users, \$350 (includes a single-user copy of The Norton Utilities, Version 8.0). Symantec Corp., 2500 Broadway, Suite 200, Santa Monica, CA 90404-3063. 800-441-7234, 503-334-6054. Circle 971 on reader service card

► TELEPHONE MESSAGING

Phone Message-Taking Made Easy

BY JOE SALEMI

Four new low-end messaging systems, from Software Grove Corp., Cross International, and Caliente International, are intended to replace those little pink telephone message pads that are so commonplace in the typical office. Each of these products is easier to install and use than a full-blown e-mail system and provides a database for tracking phone messages. Of the four, we found that Caliente International's *While You Were Out*, Version 4.1, stands out with a strong mix of features, low cost, and exceptional ease-of-use.

SOFTWARE GROVE CORP.

• MESSAGES

Messages, Version 2.0, the newest release of this package, adds a PIM-like automatic phone dialer and a simple mail system to the list of features. The product still utilizes a very friendly interface that closely resembles those pink memo pads. It is also easy to install and offers two levels of security.

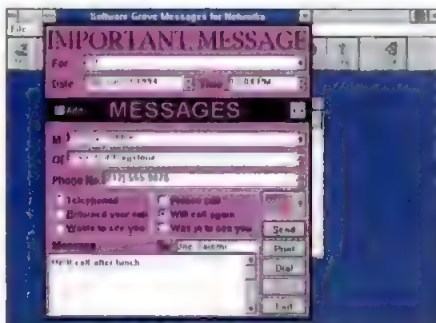
During installation, Messages can be configured to offer one of two types of user access: *Message Center* or *Private Inbox*. A Message Center user is able to access every user's mailbox as well as Messages' system log files. While you are not required to use a Message Center to run Messages, we found it a useful option for organizations with centralized phone and message centers. Private Inbox users can read only their own messages, and all user accounts are password-protected to maintain security.

In Messages, phone messages are entered through the familiar pink telephone-memo screen. You can set different levels of importance on each message, as you would with an e-mail system. This default screen is also used to scroll through incoming messages.

Caller information, such as name and phone number, is stored in a Windows

Cardfile database. When you fill out a message form for a caller already in the database, Messages will automatically fill in the company name and phone number fields. You can also select callers for a new message from a pull-down menu of callers in the database.

Messages 2.0 adds a telephone auto-dialer, which allows you to call the phone number in a message via a modem. This latest version also includes a convenient simple mail system with which you can



THINK PINK: Messages' interface should be very familiar to most users.

send short notes to other Messages' users.

Messages is the most expensive of the four products in this review, but it also offers the most features and greatest versatility, which may offset the cost for some users. Messages' close resemblance to the paper memo pads it's intended to replace makes it very user-friendly and the PIM features make it versatile for

day-to-day use.

► **Messages, Version 2.0.** List Price: For 1 user, \$69.95; for 5 users, \$249; for 10 users, \$399; for 20 users, \$599. Software Grove Corp., 12525 Willows Rd., Suite 130, Kirkland, WA 98034; 206-823-0833; fax, 800-793-0040.

Circle 964 on reader service card

CROSS INTERNATIONAL

• NETTALK and NETTALK+PLUS

Do you receive lots of interoffice messages? Then consider Cross International's new NetTalk, Version 3.0, and NetTalk+PLUS, Version 3.0. While these two packages let you record only four-character phone numbers, they offer some powerful features. NetTalk is the basic package that includes both DOS and Microsoft Windows 3.x software, providing basic message-taking features and quick user-to-user notes, as well as real-time chats for up to four users. NetTalk+PLUS, the advanced version, is strictly for Windows. It adds a telephone directory and additional messaging options, such as a rules-based system for handling incoming messages.

Like Messages, both of these products are easy to install. Each user account is activated by running the setup program from a shared NetTalk directory. Both products automatically utilize the user's NetWare login name or NetBIOS name as the NetTalk ID. Security is provided by the ID, and users can read only their own messages.

NetTalk's messaging screen has only three fields: the caller name, a four-digit

► SUMMARY OF FEATURES

Telephone Messaging

Products listed in alphabetical order

■ = YES □ = NO

	Messages, Version 2.0
List price (10 users)	\$399.00
Drop-down list of callers	■
Contact directory	■
Real-time chat	■
User-to-user messages	■
Import and export file formats:	
ASCII text	□
.DBF	□
Windows Cardfile	■

* User-to-user messages must be sent via a VIM or MAPI e-mail system.

	NetTalk, Version 3.0	NetTalk+PLUS, Version 3.0	While You Were Out, Version 4.1
List price (10 users)	\$99.00	\$199.00	\$189.95
Drop-down list of callers	□	□	■
Contact directory	□	■	■
Real-time chat	■	■	□
User-to-user messages	■	■	■
Import and export file formats:			
ASCII text	□	□	■
.DBF	□	□	■
Windows Cardfile	□	□	■

telephone extension, and the name of the intended recipient, which can be filled in from a drop-down list of known users. A secondary message window provides more options, including a two-line notes field. We found NetTalk's multiple message screens somewhat less intuitive than methods used by the other products here.

When a call comes in, a message can immediately be sent to the intended recipient's PC. The recipient is notified via a pop-up window that provides a few response options, such as "Take a message." If the recipient chooses this option, or isn't logged on to the LAN, the person taking the call is prompted with the secondary message screen.

NetTalk's user-to-user messaging system is called Yellow Sticky Notes, and it works much like Messages' user-to-user system. Notes are automatically sent to their recipient and also stored for later use. A real-time chat feature for up to four users is also available.

NetTalk is also available from Moses Computers as MosesCALLS!, which is functionally identical to NetTalk but is available in a wider range of user licenses. Also, the unlimited user license of MosesCALLS! is considerably cheaper than Cross's version (\$300 for MosesCALLS! versus \$400 for NetTalk).

A number of additional features are included in NetTalk+PLUS, such as a telephone directory database and a rules-based system that lets users set conditions for handling incoming messages. For example, you can define a rule that tells the person taking the call to interrupt you only if the boss calls.

NetTalk and NetTalk+PLUS are the only products in this review that notify users of incoming calls in real time, but they are fairly complex, they only support four-digit extensions for phone numbers, and they are generally much less intuitive than Messages and While You Were Out.

► **NetTalk, Version 3.0.** List Price: For 10

users, \$99; for 25 users, \$199; for unlimited users, \$399. **NetTalk+PLUS, Version 3.0.** List Price: For 10 users, \$199; for 25 users, \$299; for unlimited users, \$499. Cross International, 854 Walnut St., Suite B, Boulder, CO 80302; 303-440-7313. Distributed by Direct Micro: 800-228-2887, 614-771-8771.

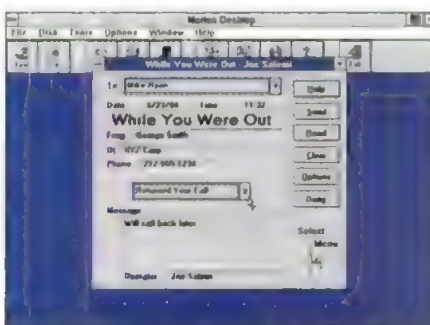
Circle 963 on reader service card

CALIENTE INTERNATIONAL

• WHILE YOU WERE OUT

The new version of the Windows-based While You Were Out (WYWO), Version 4.1, provides some impressive features such as an automatic dialer, phone directory, and import/export capabilities. These are added to its friendly interface, support for both MAPI and VIM e-mail systems, and a separate utility for monitoring the message queue. Best of all this is a shareware product, so you can try it before you buy it.

Like the rest of the products here, WYWO is easy to install. Once the package is installed, the main screen provides access to its many features.



A SHAREWARE SUCCESS: While You Were Out provides a wide range of easy to use features.

When you enter a message in WYWO, you use drop-down lists to specify the recipient and the type of message. The Operator Assist function automatically stores the information from the caller fields into the recipient's telephone directory.

Version 4.1 can also dial numbers from this directory via a modem.

WYWO allows you to put users into groups, so that you can send a message to an entire department at one time. WYWO's security system allows any user to check any other user's messages, but

user IDs can be password-protected to prevent unauthorized access.

WYWO does not support user-to-user messaging directly, although it can send (but not receive) messages over a MAPI or VIM e-mail system: You simply select "Mail" in the recipient field of a message.

The WYWO Carousel is a unique feature that lets you monitor all users' message boxes. It looks like a typical office message rack, and each message appears as a pink slip in the slots. It can also display the pending messages in a list, with memo icons next to the users names. From the

Carousel, messages can be read but can't be modified or deleted.

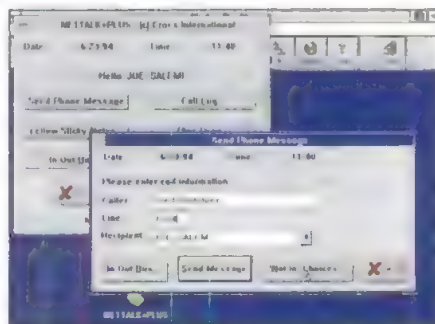
Another unique feature is WYWO's use of the right mouse button: While you enter a message, you can click the right mouse button to call up an on-line

phone book. Caller information can then be selected directly from the phone book. In addition, when you're reading a message, the right mouse button brings up a message-handling menu that gives you the option of printing or forwarding the message, exporting the message to a file, or dialing the caller.

Because WYWO is shareware, you have the option of trying it before you purchase—a definite plus. A fully-functional 3-user version can be downloaded from CompuServe or Caliente's support BBS (203-667-2768).

While You Were Out is the easiest to use of the four telephone messaging systems we reviewed, yet it offers several powerful features. The overall combination of low cost, ease of use, and features like right-mouse-button menus and the Carousel also make it the best messaging system of the group.

► **While You Were Out, Version 4.1.** List Price: For 5 users, \$99.95; for 10 users, \$189.95; for 20 users, \$349.95; for 50 users, \$750; for 100 users, \$1,250. Caliente International, 51 Market Sq., Newington, CT 06111; 800-334-7202, 203-667-2159. Circle 962 on reader service card



WHY NOT JUST ONE? NetTalk+PLUS uses two windows for message-taking.

NetWare

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Complete Computing, Inc.
Little Rock - 501-372-3379

California (Northern)

Tech Data, San Mateo
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Ingram Micro, Fremont
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ATV, Silicon Valley
800-933-NOVL (6685)

ATV, Sacramento
800-933-NOVL (6685)

California (Southern)

Tech Data, Los Angeles
(Santa Ana) - 800-TD-4-TRNG

Merisel, Santa Ana*
800-332-1803

Ingram Micro, Santa Ana
800-234-9220

New Horizons Computer
Learning Ctr., Santa Ana
800-622-7763 x428

HTR, Los Angeles
800-882-6420

ATV, Los Angeles (Santa Monica)
800-933-NOVL (6685)

Vortex Data Systems
San Diego - 619-497-6400

Colorado

Training Access/Random Access
Denver - 800-422-2383

Colorado Computer Training
Institute, Denver - 800-569-1894

Connecticut

NextAge Training Center
Norwalk - 800-989-8989

:Track On, East Granby*
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HBM Education Center
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Tech Data, Miami
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Systemark of Orlando, Inc.
Orlando - 800-654-2375

The Waldec Group, Tampa
813-286-8086

Georgia

Tech Data, Atlanta
(Norcross) - 800-TD-4-TRNG

Allied Data Communications
Group, Norcross - 404-923-4866

Merisel, Atlanta*
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Memorex Telex, Atlanta
800-247-NAEC (6232)

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Ingram Micro, Chicago
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LANtech/USConnect
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Help Desk Training, Des Moines
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Micro Computer Solutions, Inc.
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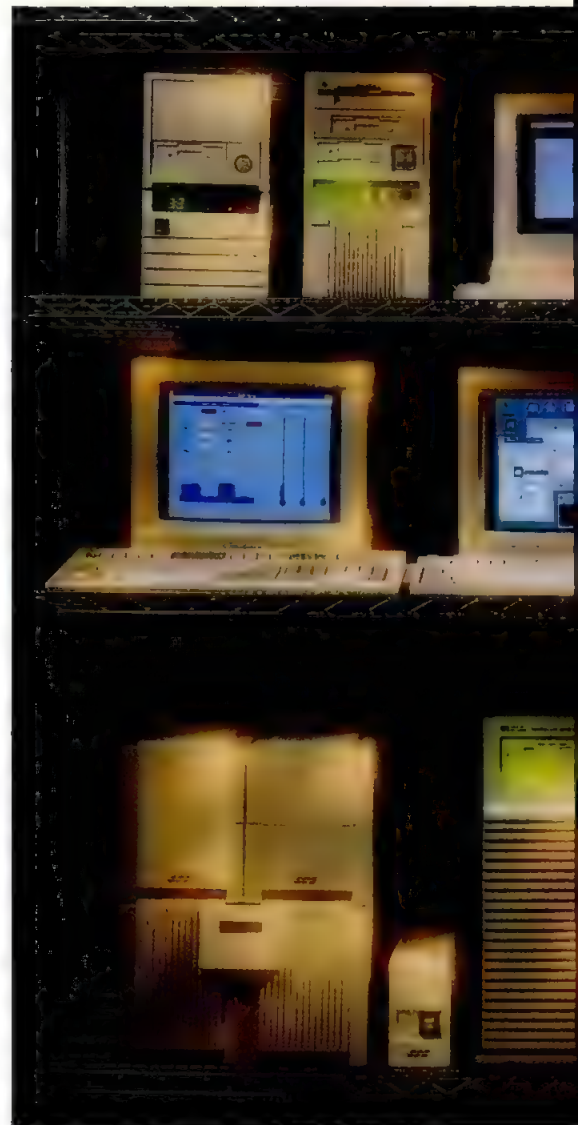
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Merisel, Boston
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HTR, Boston
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AMRIS Training Systems, DFW Intl. Airport - 800-842-3693 x683

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Merisel, Tysons*
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HTR, McLean
800-882-6420

IBIS Corporation, Herndon
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Washington

Training Access/Random Access, Seattle - 800-422-2383

Merisel, Kirkland*
800-332-1803

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Micro Information Services, Inc. USConnect Milwaukee
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► FAX SERVERS

U.S. Robotics Stands Alone on Price

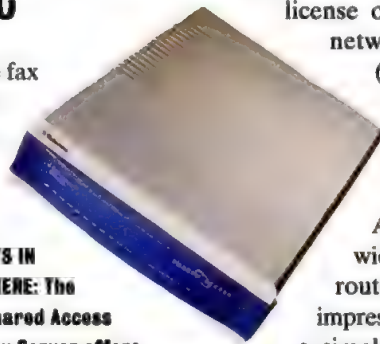
BY JAMES KARNEY

At \$2,495, U.S. Robotics' Shared Access Fax Server is not only more affordable than most of its competitors, it also includes a number of features that are more typically available only as expensive add-ons. These include OCR support, fax routing via e-mail, and advanced management utilities.

The Shared Access Fax Server is well designed and compact—about the size of a ream of copy paper. The unit houses a 14,400-bps fax modem that supports the CCITT Group 3 fax-compression standard (which allows for fax transmissions of 9,600 bps or more), and it emulates Hewlett-Packard Printer Control Language

IV, or PCL-4 (which allows the fax server to handle complex fonts and graphics). A second 14,400-bps fax modem can be added to support two fax lines (U.S. Robotics' 14,400-bps Sportster Fax Modem costs \$199). Its closest competitor, Castelle's FaxPress 2000, offers a two-line model with two built-in 9,600-bps modems, but the FaxPress 2000 costs roughly \$800 more than the Shared Access Fax Server with a second modem. RightFax 3.5, the other fax server reviewed in this issue, costs only \$995 initially, but it runs over \$4,000—plus the cost of a PC—for a single-line configuration with similar features.

IT'S IN THERE: The Shared Access Fax Server offers a ton of features for under \$3,000.



The Shared Access Fax Server is easy to access; users select it just as they would select a network printer. The product includes an unlimited user license of Optus FACSys network fax software (which includes both DOS and Windows versions).

The Shared Access Fax Server's wide range of fax-routing capabilities is impressive. These include a simple fax queue from which you can select particular faxes for retrieval, as well as automatic routing via an existing MHS or Lotus cc:Mail e-mail system. The Shared Access Fax Server includes OCR support, which can be used with Called Subscriber Identification (CSID) to route faxes based on information in a fax's header.

On the other hand, the FaxPress 2000

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▶ FACT FILE

Shared Access Fax Server**List price:** Ethernet, \$2,495, Token-Ring, \$2,795**In short:** The Shared Access Fax Server is one of the most cost-effective fax-server solutions we've seen. For under \$3,000, it provides OCR and e-mail routing, some powerful fax management features, and support for a second fax line. To top things off, the unit is very easy to set up and use.

U.S. Robotics Inc., 8100 N. McCormick Blvd., Skokie, IL 60076-2999, 800-342-5877, 708-982-5010; fax, 708-982-5235

951 on reader service card

also supports MHS e-mail routing with optional support for Lotus cc:Mail fax routing (a \$295 add-on), but it does not support OCR. Castle's fax server does offer a routing technology not supported by the Shared Access Fax Server: Direct Inward Dialing (DID), which lets a user assign multiple, individual fax numbers to a single fax line.

We were impressed by the Shared Access Fax Server's many fax management features. For example, we generat-

ed a detailed report of incoming and outgoing traffic, time on-line, the location of remote sites, and all errors without a hitch. Also, users can assign billing codes so that faxes can be tracked for expense purposes. Security is strong, and the Shared Access Fax Server can be configured to display in the queue only the cover pages of faxes to those users not designated as recipients.

EASY TO SET UP, EASY TO USE

We tested the Ethernet version of the Shared Access Fax Server (a separate model is available for Token-Ring) on a NetWare 3.12 network. The unit includes network connectors for both thin and thick coax and 10BaseT (the Token-Ring model supports both 4 and 16 megabits per second and includes connectors for IBM Type 1 and 2 cables).

The Shared Access Fax Server could not be any easier to install; after connecting it to our server with thin coax, we simply ran a network setup routine

that defined the device as a NetWare printer. To complete the process, we just powered the device off and then back on. It came back to life and automatically logged itself on to the network. The same will happen if the server ever goes down.

After the unit was running, we provided access to each of our clients through the Printers utility under the Windows Control Panel. To run the Windows setup, we simply loaded the installation disk on our NetWare server and did all the setups from a common directory.

Sending faxes through the Shared Access Fax Server was a breeze. We sent faxes from a variety of Windows applications, including Microsoft Word for Windows, Version 6.0, and CorelDRAW, Version 5.0, without a problem.

The Shared Access Fax Server doesn't offer every feature known to the fax-server world, but it offers quite a few. The fact that all these features are available for under \$3,000 makes it a bargain.

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CIRCLE 905 ON READER SERVICE CARD

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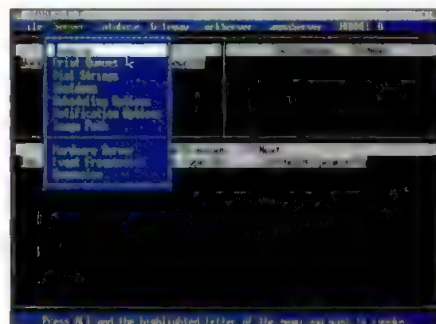
RightFAX: Really the Right Fax Server?

On the surface, Version 3.5 of RightFAX offers a lot: It's one of the first fax-server software packages to support binary-file transfer (BFT), it provides a variety of fax routing options, and it's less expensive than a standalone fax server.

RightFAX (\$995), from the company of the same name, allows an OS/2 PC to act as a fax server for NetWare, Microsoft LAN Manager, and OS/2 LAN Server clients. The fact that RightFAX requires OS/2 on the server could pose a problem

Each of the client interfaces is intuitive and easy to use. Users send faxes just as if they were printing documents. Incoming faxes can be automatically routed to a printer or delivered via an e-mail system using the vendor's optional e-mail gateway software module.

The software requires the server to have a fax board. Currently, RightFAX is compatible with boards from GammaFax and Brooktrout, although BFT is sup-



ported only with GammaFax boards. These boards add to the overall cost of the fax server: The GammaFax boards start at \$895 (for a single-line model), and the Brooktrout boards start at \$1,895 (for a dual-line model). Together with the software, OCR support (\$1,195), and e-mail support (\$995), a complete RightFAX system can run in excess of \$4,000.

Faxes are easy to send with RightFAX and just as easy to view. We were able to open and view faxes we received very

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The LANMeter defines the term "fast." You can learn it in under 30 minutes. Simply push a button for quick answers without complex programming or wading through screens of decodes. And its compact size makes it easy to use under a desk or in a wiring closet.

quickly. We also had no difficulty creating and sending faxes...until we tried to use BFT under Windows for Workgroups (WfWG).

The problem was that we had to sacrifice file sharing between our WfWG clients: In order to use BFT, we had to remove a line from each PC's CONFIG.SYS file that enabled file sharing. We also had to load a NetWare file called DOSNP in each AUTOEXEC.BAT file to enable named piping (which allows for communications between two processes).

RightFAX does, however, have some good fax management features. For example, the product notifies the network administrator of any faxes that remain unread for a specified amount of time so that they can be archived or deleted. If you're going to be away from the office, you can designate an alternate recipient so that someone gets your incoming faxes before the administrator archives them.

Unlike most fax servers, RightFAX preserves disk space by storing faxes in

Right and Wrong

RightFAX 3.5 can be a powerful fax server—but only in very specific environments. Here are a few of the product's benefits and trade-offs.

Benefit	Trade-off
● It has a low initial cost: only \$995 for the software and \$895 for a fax board.	● Options such as OCR and e-mail routing can push the cost above \$4,000.
● It supports the CCITT T.434 standard for binary-file transfer (BFT).	● On Windows for Workgroups clients, BFT works only when file-sharing is disabled.

native ITU (International Trade Union, the CCITT's new name) Group 3 format—the standard fax machine format—rather than converting them to bitmaps.

We set up RightFAX with the bundled GammaFax CPi single-line fax board on a NetWare 3.12 network with WfWG clients. Installing the GammaFax board in the server was straightforward and required only one DIP switch change. The excellent documentation made installation easy; it offers detailed illustrations for each fax board the product supports. The server software was also easy to set up,

thanks in part to the well-designed installation utility.

Setting up the DOS and OS/2 client software was just as free of problems, but the same cannot be said for our WfWG clients. One of RightFAX's dynamic link libraries (DLLs) was incompatible with our WfWG network: When we loaded it into our system directory, Windows failed to load entirely. Without the DLL, the fax software locked up our system.

RightFAX is aware of the problem and is working on a fix, but we feel that incompatibility with such a widely used operating environment is a major drawback.

RightFAX is easy to use and offers strong fax management features, but the overall cost and the limitations of BFT may negate those advantages.

► **RightFAX, Version 3.5.** List price: \$995; OCR module, \$1,195; e-mail gateway, \$995. RightFAX Inc., 4400 East Broadway, #312, Tucson, AZ 85711; 602-327-1357; fax, 602-321-7456.

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Tools for Healthier LANs

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► MATRIX SWITCH

A Way to Stay Out of the Wiring Closet

BY O. RYAN TABIBIAN

The wiring closet. Every network administrator dreads the trip to it, because a seemingly simple network configuration can often lead to hours of cable-pulling and other frustrations. Now, NHC Communications may have a solution to prevent these painful visits: the ShareIt switch.

ShareIt (\$2,700) is a physical-layer, or *matrix*, switch that is designed to simplify network management and reconfiguration by connecting up to 48 network segments in a single, logical, SNMP-manageable device. Since it establishes physical connections between segments, ShareIt is network-independent.

The product is like a software-based patch panel—a wiring board that lets you change cable connections by moving plugs on a board instead of tampering with the cables themselves. Like a patch panel, however, ShareIt provides no fault tolerance. This can be a major deficiency for many network environments.

ShareIt was difficult to install, though most of the difficulty was due to the learning curve associated with matrix switches in general. The poorly written documentation didn't help much. Still, the unit performed as promised: It enabled us to change and reconfigure our network connections easily through software, all for under \$3,000.

Comparable products do exist but cost far more. Other matrix switches, such as the Unity series from Bytex, are intended for mainframe or midrange environments and run anywhere from \$5,000 to well over \$100,000. Some network hubs that provide similar switching to ShareIt's (for instance, Bytex's Series 7700 Intelligent Switching

Hub and Synoptics' LattisSystem 5000) can also cost tens of thousands of dollars, but as repeaters these products are protocol-dependent while ShareIt is not.

Packet switches, such as Kalpana's EtherSwitch, are LAN-dependent and connect segments based on the Ethernet addresses of frames. Network managers use packet switches primarily to increase throughput—not for reconfiguration.

THE POWER OF SOFTWARE

The key to ShareIt is the management software. It allowed us to assign devices to ports on the device



AN END
TO CABLE-
PULLING?

ShareIt, from NHC Communications, is a matrix switch that lets you change devices' physical connections through Windows-based software.

without physically changing any wiring, a concept often referred to as *virtual networking*. The software runs on any Microsoft Windows-based PC and uses a serial connection (direct or remote through a modem) to the switch to manage network connections. Though the management software does not have a drag-and-drop interface, it is very easy to use. It is not SNMP-based, but ShareIt includes an agent for management from an SNMP console.

We tested the product on a 4-segment, 16-client NetWare 3.12 Ethernet network and found ShareIt well-suited to simplifying network management in two

specific ways.

The first is managing multiple segments on large networks; ShareIt works very well with troubleshooting tools. We used Network General's Sniffer (\$5,000 to \$8,000) to monitor traffic status on each segment from a single console by simply reassigning the Sniffer to each segment one at a time. With this process we couldn't monitor all segments at once, but it is considerably less expensive than the alternative: using Network General's Distributed Sniffer, which can monitor multiple segments but costs around \$8,000 per segment (a total of \$32,000 for our configuration).

Second, ShareIt greatly simplifies network reconfiguration, especially when multiple hubs, routers, or bridges are connected. To redirect one Ethernet segment's traffic from router A to router B, you simply highlight the segment and select the new router from a list.

This, however, is where ShareIt's one major weakness becomes apparent: a lack of fault tolerance. Any time you tie multiple vital network devices to a single unit, fault tolerance is a major concern; you don't want a problem with the switch taking down *all* your hubs and routers. Unfortunately, ShareIt provides no fault tolerance—not even redundant fans or power supplies. We would like some form of fault tolerance and suggest you at least

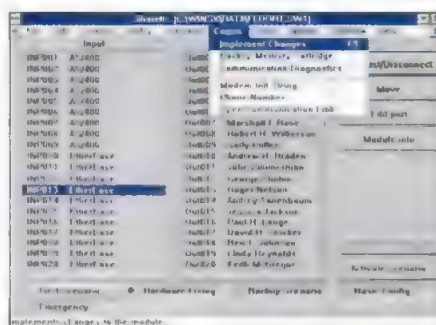
hook ShareIt up to a UPS. You might even consider a backup ShareIt to take over for the primary unit in case of failure.

Without fault tolerance built in, ShareIt is not likely to be popular for connecting mission-critical devices.

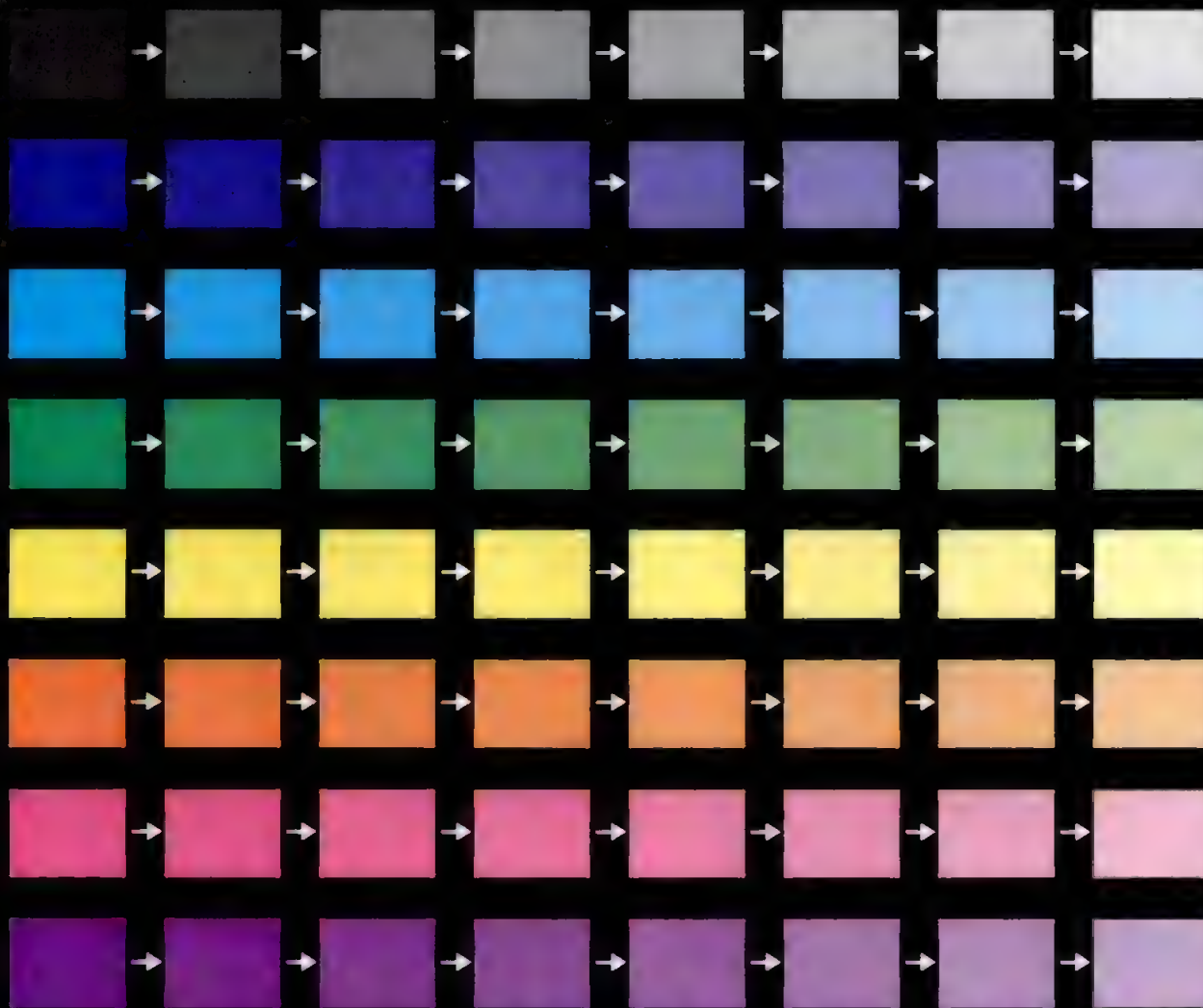
But if you don't need fault tolerance or are willing to add external devices to provide it, ShareIt can be an ideal solution for simplifying the management and configuration of multiple segments and devices.

► **ShareIt.** List price: \$2,700. NHC Communications, 5450 Cote De Liesse, Mount Royal, Quebec, Canada H4P 1A5; 514-735-2741; fax, 514-735-8057.

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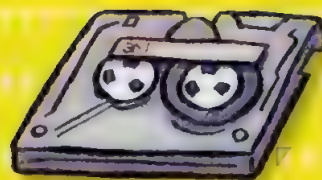
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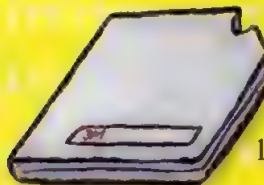


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3M *Reliability*

News of announced network products and upgrades

By Vicki B. Jacobson

NEW

Metricom Brings Wireless to the Masses

With its new wireless WAN, **Metricom** introduces a wireless service it claims is faster and less expensive than many others. The Ricochet Micro Cellular Data Network (MCDN) allows users of stationary and portable computers, as well as Personal Digital Assistants (PDAs), to send and receive graphics and large data files locally or over the WAN.

The Ricochet system consists of radio modems (the size of TV remote-control units) for users and packet radio units (the size of toasters) that are installed on top of buildings or telephone poles. These radio units differ from traditional wireless networks in that they do not require tower-based wireless infrastructures. The units can operate at distances of up to 2 to 5 miles.

Ricochet also differs in its higher transmission speeds and low cost of implementation. The company claims it can transmit data up to 77 kilobits per second; other wireless networks report speeds up to 19.2 Kbps. Ricochet uses spread-spectrum technology to transmit over license-free frequencies. Because there is no FCC licensing fee, costs typically passed on to the user are eliminated.

► **Ricochet Micro Cellular Data Network (MCDN).** List price: *Fixed monthly rate depending on data-transmission speed and priority.* **Portable radio modem.** List price: \$495. Metricom Inc., 980 University Ave., Los Gatos, CA 95030; 408-399-8200.

Circle 953 on reader service card

NEW

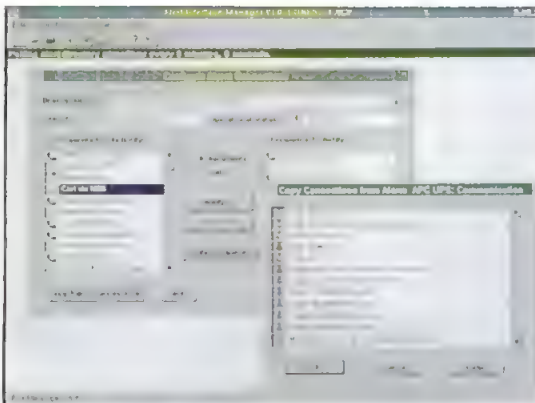
Frye's AIM Sounds the Alarm

What's going on—and off—is the focus of **Frye Computer Systems'** latest network management package. The Frye Utilities for Networks—Alert Interface Manager (AIM), Version 1.0, provides network managers with critical information about power-related and backup events.

The snap-in module integrates with American Power Conversion Corp.'s uninterruptible power supply products through Novell's NetWare Management System to provide monitoring of events such as communication failures, low-battery status, and rebooting. In the case of such events, the software sends an alarm notification to the network manager via beeper, alphanumeric pager, MHS message, or e-mail.

► **The Frye Utilities for Networks—Alert Interface Manager (AIM), Version 1.0.** List price: \$895. Frye Computer Systems Inc., 19 Temple Place, Boston, MA 02111; 617-451-5400; fax, 617-451-6711.

Circle 960 on reader service card



TAKE AIM: The software sends the network manager an alarm notification in case of failures.

HOT PROSPECT

Netcom Simplifies Internet Access



Move over, Mosaic! There's a new kid on the block—**NetCruiser** from **Netcom On-Line Communications Services**. NetCruiser uses a graphical interface, Internet Site Chooser, for access to such Internet tools as the World-Wide Web, Gopher, and File Transfer Protocol (FTP), as well as Usenet, e-mail, finger, and telnet. NetCruiser, like Mosaic, eliminates the need for using difficult Unix commands and instead offers an easy point-and-click interface.

NetCruiser differs from Mosaic in several ways. Mosaic is primarily a Web browser; NetCruiser is an all-encompassing Windows program that provides support for a variety of Internet functions. In addition, NetCruiser provides automatic on-line updates from within the software.

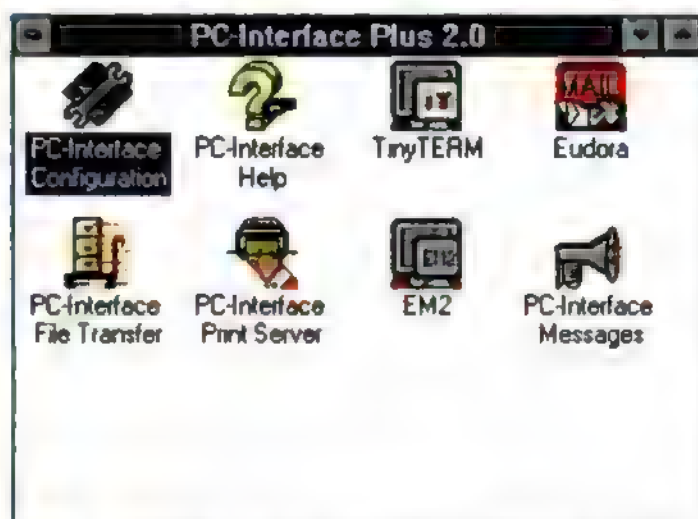
► **NetCruiser software.** List price: *Free with Internet access service.* **NetCruiser accounts.** List price: \$25 start up fee; \$19.95 per month. Netcom On-Line Communications Services Inc., 3031 Tisch Way, 2d floor, San Jose, CA 95128; 800-353-6600, 408-345-2600; fax, 408-241-9145.

Circle 961 on reader service card

IMPROVED

Locus Enhances PC-to-Unix Connectivity

The latest versions of Locus Computing Corp.'s PC-Interface and PC-Interface Plus software target better access to the enterprise network and the Internet for both the desktop PC and Unix user. With the package, users get gateway access to enterprise services such as NFS (Network File System), DFS (Distributed File System), and AFS (Andrew File System) from a Unix server—without having to learn Unix.



MORE WINDOWS: PC-Interface's Windows programs include an FTP app and Eudora e-mail.

PC-Interface, Version 5.0, introduces new capabilities for the user and the administrator: The software now includes an integrated TCP/IP stack from Novell, a Windows-based implementation of FTP, and enhanced Windows support (support for Microsoft Windows for Workgroups, Version 3.11, and a Unix utility in the Windows File Manager). PC-Interface Plus, Version 2.0, also offers a Windows program

(Eudora By Qualcomm) for access to local, enterprise, and Internet e-mail.

► **PC-Interface, Version 5.0.** List price: \$279. **PC-Interface Plus, Version 2.0.** List price: \$449. Locus Computing Corp., 9800 La Cienega Blvd., Inglewood, CA 90301-4440; 310-670-6500.

Circle 957 on reader service card

IMPROVED

InVision Eases Interoperability

With the new version of InVision Systems Corp.'s desktop videoconferencing software, users can pick the hardware that best fits their budget and application needs. InVision, Version 3.0, lets users establish conferencing connections regardless of the installed codec (coder/decoder that compresses information for transmission). Version 3.0 is compatible with Microsoft Video for Windows, providing users with a choice of popular codec boards.

The videoconferencing software also incorporates VisionGraphics, an interactive document-conferencing system. VisionGraphics lets multiple users share documents and files. InVision works over Ethernet, Token-Ring, FDDI, T1, ISDN, frame relay, and ATM.

► **InVision, Version 3.0.** List price: \$595. InVision Systems Corp., 8500 Leesburg Pike, Ste. #300, Vienna, VA 22182; 703-506-0094; fax, 703-506-0098.

Circle 955 on reader service card

NEW

Throughput Gets a Boost from Cabletron

Cabletron Systems has released its first full duplex Ethernet adapters for the PC—the E2200 Full Duplex Ethernet Desktop Network Interface (DNI) cards. The cards can operate in either full duplex 20-megabit-per-second Ethernet mode or 10-Mbps standard Ethernet mode. All four of the DNI cards are Plug and Play, offering automatic installation and compatibility.

The E2200 family consists of the E2210 for UTP and AUI connections, the E2212 for UTP and coax connections, the E2219 for UTP connections, and the E221W for UTP or wireless environments.

► **Cabletron E2200 series.** List price: \$349–\$449. Cabletron Systems, 35 Industrial Way, Rochester, NH 03867-0505; 603-332-9400.

Circle 956 on reader service card

BRIEFS

HUBS

3Com Corp. announced enhancements to three of its hubs, ranging from the low to high end. New features for the LinkBuilder MSH include enhanced management support through remote monitoring (RMON) and a new LinkBuilder MSH Fiber RingBuilder module (\$1,995). The LANplex 6000 switching hub now features IP routing (available at no extra cost); its management software, Transcend LANplex Manager (\$4,995), adds support for HP OpenView. 408-764-5000.

Chipcom Corp. introduced a variety of ATM products, including an ATM Switch Module (pricing to be announced) and three User-Network Interface (UNI) modules for the ONcore Switching System (pricing to be announced). The modules target different ATM speeds: 155 Mbps, 100 Mbps, and 25 Mbps. 508-460-8900.

ROUTERS

Newport Systems Solutions' new version of its software-based router provides remote users with access to their corporate network. The LAN2LAN/MPR Remote Office (\$1,395) provides bridging and routing capabilities for up to four LANs and two WANs. To reduce the cost of WAN connectivity, the software also includes such features as data compression and manual dialing. 714-752-1511.

Cayman Systems also moves into the branch-office market with the addition of dial-up and dedicated-line features to its GatorRoute iR (\$2,495) and GatorStar iHR (\$4,495). Each features two WAN ports for connection between the remote site and the corporate site. 617-932-1100.

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T B O O S N T F F E R

NEW

Saber Extends Management to Servers

Saber Software Corp. extends the breadth of its network management solutions with the announcement of its new server management software. Saber Server Manager allows network administrators to track, configure, and optimize the performance of their enterprise-wide file servers. In conjunction with NetWare 3.x, Saber Server Manager works with over 60 internal NetWare parameters, including communications settings and memory allocations. The software collects data and allows the administrator to view and analyze that data for possible changes to the servers' configuration. Administrators can configure their servers to match their needs, whether high-end client/server applications or file and print services.

► **Saber Server Manager.** List price: \$695. Saber Software Corp., 5944 Luther Ln., Ste. #1007, Dallas, TX 75225; 800-338-8754, 214-361-8086; fax, 214-361-1882.

Circle 958 on reader service card

IMPROVED

ZyXEL Pushes Cellular Communications

Recognizing the need for continuous access, **ZyXEL** has added cellular capabilities to its full line of modems. What was once an option is now a standard feature. The modems, equipped with ZyCellular, can achieve cellular data-transfer rates of up to 14.4 Kbps.

ZyXEL also announced the latest release of its Windows-based Network Management System (NMS) software—ZyView, Version 2.4. ZyView lets network managers manage up to 4,096 local and remote modems from a PC. New features include real-time alarms, call rerouting, and a topology map.

► **ZyCellular.** List price: *Free with purchase of ZyXEL modem.* **ZyView, Version 2.4.** List price: \$700. ZyXEL, 4920

E. La Palma Ave., Anaheim, CA 92807; 714-693-0808; fax, 714-693-8811.

Circle 954 on reader service card



FULL VIEW: Version 2.4 of ZyXEL's ZyView provides network managers with a topology map of the modems.

NEW

ACC Rides the Remote Wave with Danube

Using the Danube router from **Advanced Computer Communications (ACC)**, network managers can connect their remote sites to their corporate network for under \$2,000 (though the average seems to be around \$2,500). The Danube is the latest in ACC's line of remote access bridge/routers. At the network level, support for routing protocols includes TCP/IP, IPX, and AppleTalk. Bridging is available via concurrent 802.1D transparent bridging. WAN connectivity brings speeds up to 2,048 Mbps, using, among others, frame relay, PPP, or CCITT X.25. The compact unit (weighing less than four pounds) is designed for 10BaseT or 10Base5 Ethernet networks and supports a variety of WAN interfaces, including V.24, V.35, X.21, and ISDN BRI.

► **Danube.** List price: \$1,995. Advanced Computer Communications Inc. (ACC), 10261 Bubb Rd., Cupertino, CA 95014; 408-366-9600; fax, 408-446-5234.

Circle 959 on reader service card

BRIEFS

ADAPTERS

Farallon Computing integrates its daisy-chainable 10BaseT functionality and 3Com Corp.'s parallel-tasking technology (a technology that lets the NIC receive and process data simultaneously) into its new EtherWave PCMCIA Adapter. The EtherWave PCMCIA card (\$299) is Type II compatible and supports hot-swapping capabilities. EtherWave is also standards-based and conforms to the IEEE 802.3 10BaseT specification. Using the EtherWave adapters, users can connect multiple devices (computers, portables, and printers) in a daisy chain effect without a hub. 510-814-5100; fax, 510-814-5020.

Olicom USA announced its new PCMCIA adapter, this time targeting Ethernet networks. The EtherCOM PCMCIA card (\$199 for twisted-pair, \$249 for combined twisted-pair and thin coax) complies with the PCMCIA specification. The card is compatible with major network operating systems, including NetWare 3.x and Microsoft LAN Manager. 214-423-7560; fax, 214-423-7261.

Socket Communications continues the trend of falling PCMCIA adapter prices with its EA and EA+ adapters. The EA 10BaseT Ethernet adapter is now \$249, down from \$299. The EA+ 10BaseT and 10Base2 Ethernet adapter is \$299, reduced from \$369. The adapters are compatible with Novell's NetWare 3.x and NetWare Lite, Microsoft LAN Manager and Microsoft Windows for Workgroups, Banyan Systems' VINES, and Artisoft's Simply LANtastic, as well as Novell's UnixWare, The Santa Cruz Operation's SCO Unix, and Microsoft Windows NT. 510-670-0300; fax, 510-670-0333.



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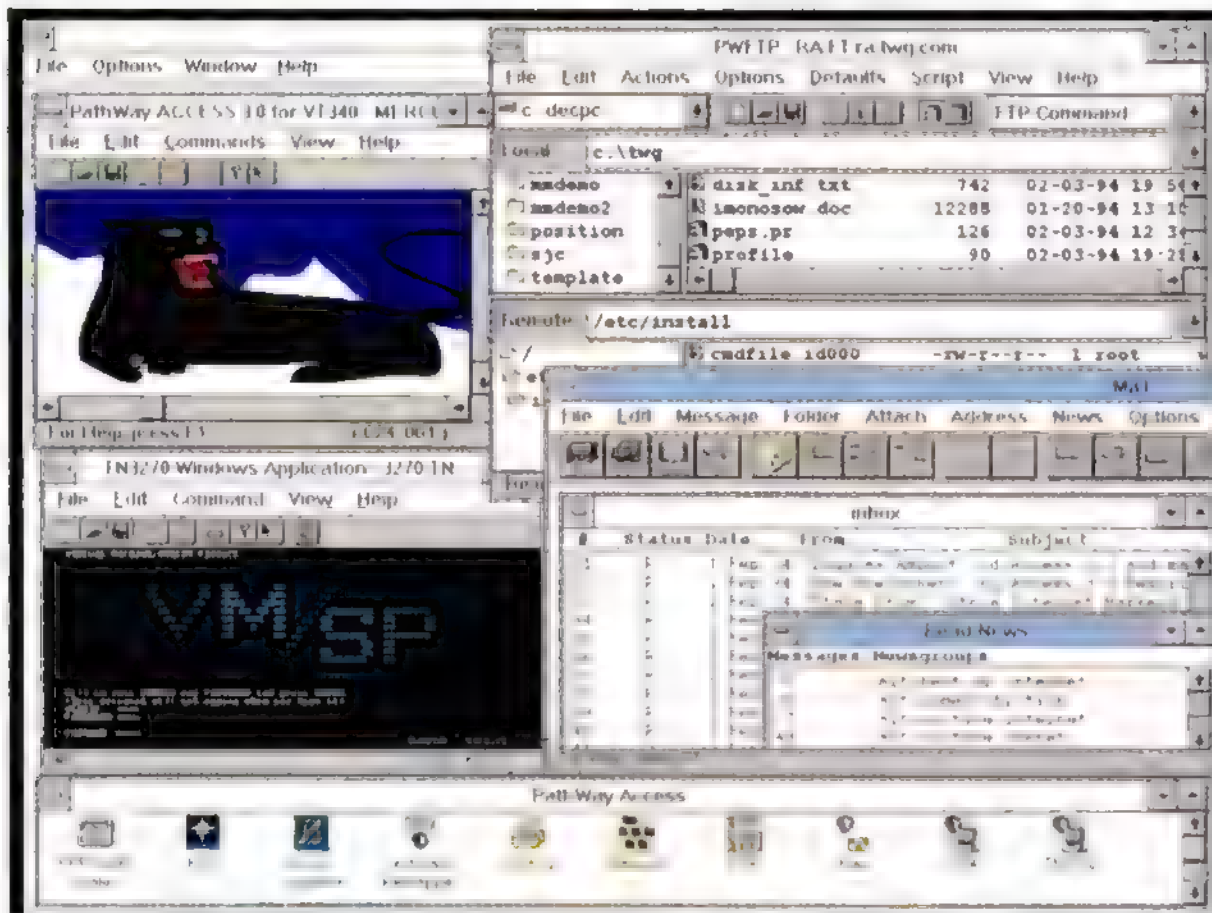
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Frame Relay Quietly Makes Inroads

Fast, affordable, and available today: Is it the WAN solution you've been looking for?

By Jeffrey D. Baher

Although ATM may have gathered the lion's share of publicity over the past few years, frame relay has quietly continued to mature into a powerful, high-speed, internetworking service with all the right ingredients for success: speed, affordability, and availability.

Frame relay is a public packet-switched data-network service available throughout the United States. As a public switched network, it is maintained and enhanced by carriers such as AT&T, MCI, and Sprint. It is designed to function as a public WAN backbone through which companies can connect multiple LANs. In fact, frame relay is very much like a large, switched LAN: Data traveling from one LAN to another is transmitted through the frame-relay network, or *cloud*, as a series of packets. Each site connects to the cloud via a 56-kilo-bit-per-second to 1.54-megabit-per-second leased line to a service provider's *point of presence* (POP), which is roughly equivalent to a local access number for CompuServe. Unlike a private, leased-line, meshed network, which would require a dedicated line for each site it accesses, a frame-relay network requires just the single leased-line connection from each site to

the cloud (see the diagram "A Question of Cost"). Because of this, a frame-relay network can save users thousands of dollars per month in leased-line charges.

One problem with the service has been interconnectivity between frame-relay networks. Today, different service pro-

viders' frame-relay networks can't communicate with each other. However, that should soon change. The new Network-to-Network Interface (NNI) specification is a standard that defines how frame-relay service providers can interconnect their networks. Several carriers have already announced plans to support the NNI, including AT&T, Southwestern Bell, Sprint, and US West.

The hardware requirements for frame-relay service are straightforward: a channel service unit/data service unit (CSU/DSU) to handle the leased-line connection and a router (a CSU/DSU is a device that allows

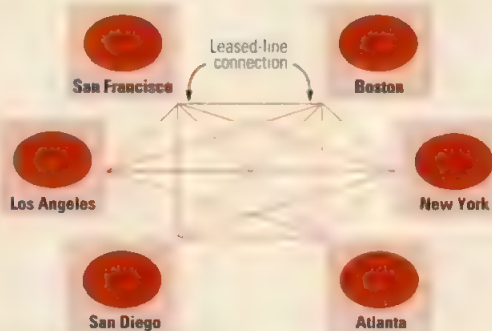
connections to digital lines). Again, the relative cost benefit is apparent: A private, leased-line, meshed network requires a CSU/DSU for each line at each site; only one is required at each frame-relay network site. Currently, all the major router vendors, including ACC, Cisco, Retix, 3Com, and WellFleet support frame relay.

Although the cost of frame-relay service varies widely from provider to provider, the cost invariably boils down to three factors. The first is the number of access points, or permanent virtual circuits (PVCs), you require. For example, if your central office connects to five other offices around the country, you require five PVCs on your frame-relay service to that site. Second, each PVC is assigned a guaranteed throughput rate, or committed information rate (CIR). Finally, a port speed must be assigned to the connection between your site and the nearest POP.

Since the public frame-relay network is made up of a collection of switches, each packet can take its own path through the

A Question of Cost

Private leased-line meshed network



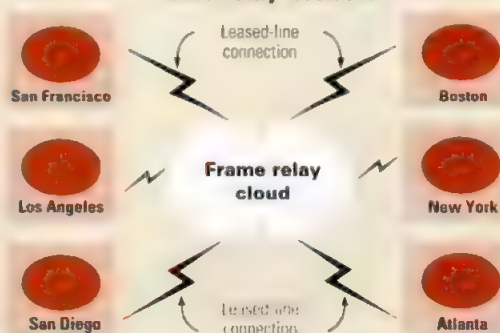
Pros:

- Guaranteed bandwidth between LAN sites
- Lower latency than switched network

Cons:

- Requires multiple, expensive leased lines at each site
- Requires considerable hardware investment

Frame relay network



Pros:

- Requires only one leased-line connection at each site
- Requires a much smaller hardware investment.

Cons:

- Higher latency than circuit-switched network
- Poorly suited to handling time-sensitive data (video, for example)

cloud. For example, five packets traveling from one LAN to another may each take a different route. The router at the destination LAN reassembles the packets in their proper order and sends them on their way.

WHY FRAME RELAY?

There are plenty of high-speed networks out there, and packet-switching is hardly bleeding-edge technology, so why frame relay? One of the primary reasons is cost. When you consider the relative hardware and service requirements of a frame relay network and a similar leased-line, meshed network, frame relay is simply the more affordable alternative.

It's also faster than other alternatives. Frame relay's predecessor, X.25, is still alive and well (most notably in Europe), but X.25 offers a maximum bandwidth of only 56 Kbps. Frame relay is based on the same technology as X.25 but doesn't perform the extensive error checking provided by X.25. Instead, frame relay relies on LAN protocols to provide error checking. As a result, it offers considerably lower

Frame-Relay Service Providers

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BellSouth	404-529-6757
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MCI	800-933-9029
NYNEX	914-644-5470
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Sprint	800-736-1130
US West	800-328-2879
Wiltel	800-364-5113

latency through the cloud and higher throughput.

Most important, however, is the fact that frame relay is widely available today. The eagerly anticipated ATM utilizes a similar switching technology, which is based on a fixed-length packet, or cell, of 53 bytes. Because the cells are so small,

most of the switching can be performed in hardware, leading to very high transmission speeds (up to 155 Mbps). Frame relay relies on software to perform the switching and is therefore slower than ATM. Again, cost is a major factor here, but so is availability: Frame relay is here—now—nationwide. ATM will be available soon, and it will provide significantly higher throughput than frame relay, but no one knows when it will come, where it will be available, or how much it will cost.

WHERE TO SIGN UP

Frame-relay service is available through both local and national service providers. Local providers, or local exchange carriers (LECs), are Regional Bell Operating Companies (RBOCs), such as Bell Atlantic and Pacific Bell, and other telecommunications companies that can set up frame-relay service between sites in a limited geographic area. For nationwide service, you would contact an interexchange carrier (IXC), such as AT&T, MCI, or Sprint, to establish service.



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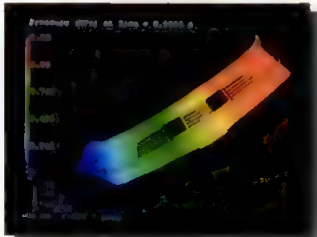
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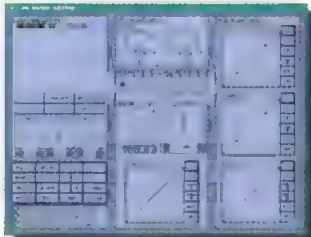
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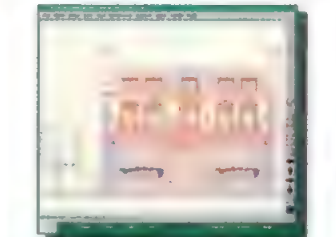
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Headaches of a Network Manager

At Network+Interop this year, the tides clearly turned away from TCP/IP and toward ATM, but internetwork—or simply internet—management remained a critical concern. Here are the top nine enterprise-internetwork problem areas that continue to plague the 75 or so network managers at my LAN-to-WAN tutorial. Despite the trends away from TCP/IP and the problems with internet management, these network managers have not been moving away from the heart of the Internet: the routers. In fact, these folks have collectively installed nearly 5,000 routers and plan to install nearly 11,000 more. Believe me, they know of what they speak.

Trained staff. First and foremost is a shortage of trained staff. Clearly, there is a shortage of people who have the technical and business skills required to operate, change, and manage an enterprise internet on a day-to-day basis. The cost of this resource is significant, representing well over 40 percent of network ownership costs across a three-year period.

Managing a backbone. Managing a multiprotocol backbone is a black art with limited practitioners, as indicated above. The multiprotocol backbone is too complex to manage easily. One reason is that there are no interprotocol communications, so one protocol cannot react to changes in bandwidth availability when another protocol consumes some of the bandwidth. Whenever there is a change to one protocol, it affects all others implicitly.

High transmission costs. Wide-area transmission costs are too high. Connecting LANs over the WAN requires monthly bandwidth payments to carriers. Analyzing transmission costs over a five-year period shows that they can represent more than 80 percent of the combined hardware, software, and transmission costs of operating the network. (Personnel costs are excluded.)

Inadequate security. There are inadequate security options in networking products today, especially those connected to the Internet. And the problems do not involve just one dimension of security. The whole environment lacks effective, painless security. Currently, the only real way to restrict Internet access, for example, is to establish cumbersome router filters, which the network manager has to maintain at great cost.



By Nick
Lippis

Lack of Design Tools: Every network manager builds an enterprise internet by trial and error; only a limited number of network design tools are available. These tools cost thousands of dollars, which makes them available only to the largest of networks. Their interfaces are anything but friendly, and the resulting construct is only an approximation of real network behavior.

Buggy router software. Though this issue is just beginning to be vocalized in the industry, the problem is an old one. The most common router troubleshooting—which occurs after an upgrade to a new version of software—is an iterative process, with the network manager providing network symptoms to the router vendor and the vendor sending fixes to its bugs. This is an exercise in quality control that the router vendor should have performed months before the software shipped.

High hardware cost. The network managers agreed that the cost of router hardware is too high. For instance, a 16-port switched Ethernet product sells today for about \$600 per port, while a 16-port Ethernet router sells for over \$3,000 per port. The extra amount is largely because of the added intelligence in a router. Still, the price per port can and should be reduced significantly.

Finger pointing among vendors. Always a danger in enterprise networks, finger pointing seems to be the biggest drawback of open-systems networks. You get multivendor connectivity but little intervender management. This means that the network manager ends up being the referee when multivendor network troubles must be solved.

High software cost. This is near the bottom of the list, but the problem may grow more significant in future business cycles. As router vendors come to realize that they are in the network software business rather than the hardware business, software prices should jump. This in turn will make all those free little software upgrades a significant cost center. Be on the lookout for vendors to start pricing their packages accordingly. □



*Open systems gives you
multivendor connectivity but little
intervendor management.*

NICK LIPPIS is a contributing editor for *PC Magazine* and is president of Strategic Networks Consulting, a consultancy specializing in enterprise networking. He is also publisher of *The Internetwork Advisor*, a monthly newsletter.

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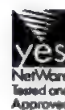
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Gall it what you will: The Bleeding Edge, Gotta Have It, Job Security, or Status Technology. Whatever you call it, when people wish for the new technological networking wonders that they read about in the weeklies, they'd often be better off if their wishes didn't come true. The potential benefit of new technology is rarely worth the headaches and trauma. Here are three of my favorite networking status technologies.

Network management is one of my all-time favorite examples of status-symbol technology. Let's call it *status technology* for consistency. An enterprise-wide network-management system is supposed to be an insurance policy and survival tool. But in my experience, most wide-scale network problems are caused by physical cable disruption, leased-telephone-line disruption, or failing LAN adapters—not routers, hubs, or some other arcane network product. High-level network-management systems don't work well to pinpoint any of those outages.

The best use of a pretty management system display is as a stopping place for VIP tours of the corporation. Fancy features such as sliding bar charts and utilization curves are merely a way to depict corporate activity. "Hey, somebody has to be working if I can show a pretty, multicolored graph creeping along the screen."

Then there's FDDI. The major advantages of fiber over copper are its resistance to electrical interference and its ability to work over long distances. But I've seen companies install FDDI simply because management thinks that the words *fiber-optic technology* will look impressive in the annual report. Outside of some scientific applications, I am hard-pressed to find good uses for FDDI.

Even Lotus Notes has an aspect of status technology. Though managers invest in Notes to improve corporate productivity, I note with amusement that under Notes we've managed to reinvent a centralized MIS bureaucracy. I see the same problems of long-delayed applications, mysterious excuses, and frustration on both sides of the glass-walled Notes server room that I saw in the age of the mainframe. Until users regain some control over application and database development, I don't see that changing.

Status technology serves to hike stock prices and foster public offerings, but it can be rather painful to try to use.



Frank Derfler:
*Be very careful
what you wish for:
There's a chance
that you just might
get it.*

Frunk, remember that today's status technologies are tomorrow's bread-and-butter apps. The good network manager simply knows when to go for it.

If you're really looking for status technology, you'll want to consider the two hottest areas at the past Interop: switches and ATM. While companies struggle for more bandwidth out of their networks, vendors are offering a supposed new solution called a switch. What's a switch but a dumb, kick-butt-fast bridge? But of course, vendors can't call their switches *bridges*. After all, nobody buys bridges anymore. People now buy switches—even if what they're buying are only fast bridges.

In truth, there's nothing wrong with using a switch/bridge to segment a network, thereby increasing throughput. Such a successful architecture will be an effective migration path to ATM.



David Greenfield:
*What's a switch?
Nothing but
a dumb,
kick-butt-fast
bridge.*

Speaking of ATM, ever wonder what will happen to all those buyers of what today are basically proprietary ATM implementations?

I put that question to ODS, a small, innovative hub company in Texas. The president, Joe Head, told me that his representatives were really pushing their clients to install ATM on the backbone. He made a perfectly good argument, pointing to the per-megabit cost of ATM. Today, ODS's hubs connect to that backbone and translate ATM cells into LAN packets. ODS even has its own line of switches.

Still, I asked Joe how these users are going to install other vendors' ATM products. It comes down to an issue of LAN Emulation. The concept is simple: Develop a method that enables broadcasts (frames that all stations see) to be properly delivered across a network (ATM) that does not support broadcast. The people installing ATM backbones now will find themselves locked into a vendor's products (say, ODS's) in a few years. As with early adopters of FDDI, who found themselves frustrated by an inability to interoperate with third-party equipment, those who jump on the ATM bandwagon early will face serious frustrations.

Frank, the real pain in status technology is that many companies forget the price paid for being on the cutting edge. The return can be great if technology is properly deployed with a keen sense of timing. Carefully considering the drawbacks can keep dreams from becoming nightmares. □

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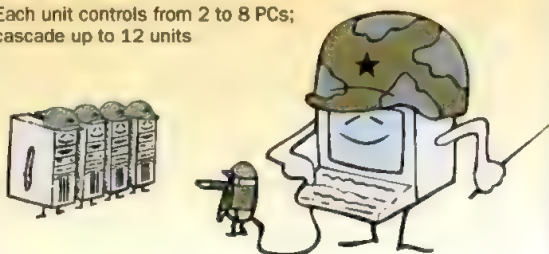
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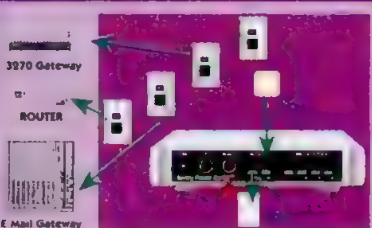
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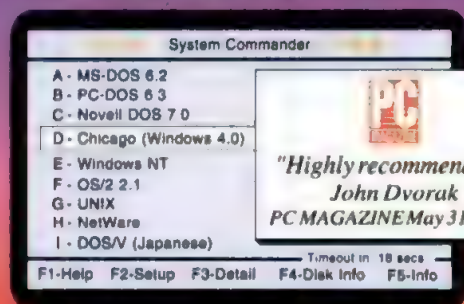
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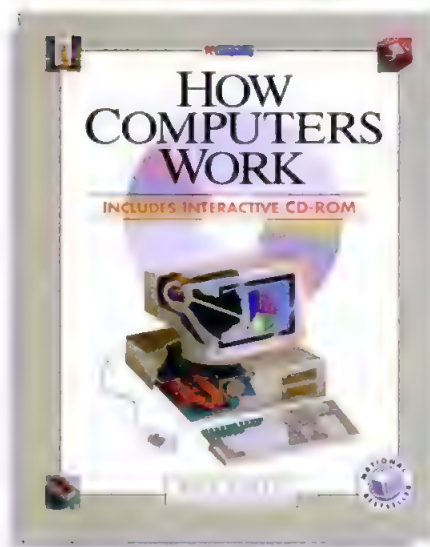
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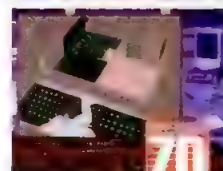
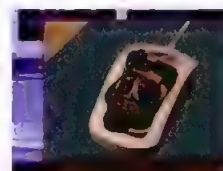
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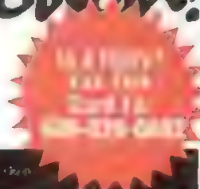
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User-to-User

BY NEIL J. RUBENKING

Speeding Windows' Setup

Even after you've installed Microsoft Windows, you'll find it necessary to keep your installation disks handy. Windows often needs other files from the disks when you change various options. If you have a spare 8MB or so of hard disk space, you can copy the installation disks to the hard disk. Make a directory called C:\WINDISKS and copy the contents of all the installation disks into it. Then, if Windows ever asks you to "Please insert the Microsoft Windows Disk #n," just type in the path C:\WINDISKS.

You can even copy the installation disks to the hard disk before installing Windows and eliminate having to watch and wait for Windows to install each disk. Just change to the WINDISKS directory and run SETUP from there. Answer a few questions at the beginning and then you can go to lunch!

*Bob Scola
Issaquah, Washington*

► **PC MAGAZINE:** You'll be surprised at how quickly the XCOPY command will copy the files from your Windows installation disks to the hard disk. Just switch to the C:\WINDISKS directory and issue the command XCOPY A:*.* for each disk (or B:*.* if you're loading from drive B:). Of course, you now have 8MB less space in which to install Windows and

your Windows applications.

When you originally install Windows from files on the hard disk, you need to stay with the process until SETUP asks for your name. Oddly enough, when you install from the hard disk, SETUP does not ask for your company name; the field is set to "Unknown Organization." After you've filled in your name, you can go to lunch; Windows will install the rest of the files itself. You will have to come back to handle SETUP's installation of programs it finds on your hard disk. SETUP can automatically install Windows applications into Program Manager groups, but it frequently asks your help in identifying DOS-based programs.

If your video board came with its own drivers disk, you're not quite finished yet. Copy that disk to the hard disk as well. Now when you use SETUP to change video modes you can tell Windows to find the driver files on the hard disk rather than searching for the drivers disk.

Capitalizing Strings

Recently I thought of a simple and elegant way to capitalize strings in a DOS batch file. All you need to do is pass the string to the PATH command and let it perform the capitalization. This takes just four straightforward steps, as illustrated in the batch file in Figure 1.

I like this method better than using a non-DOS utility, especially when writing batch files for others to use. Because PATH is an intrinsic DOS function, you don't have to supply the utility, and the procedure runs no matter what the current drive or path is. I frequently use the capitalized forms of the input arguments when I need to make a case-insensitive comparison with a list of acceptable inputs. For example, the batch file in Figure 2 accepts PROC1, PROC2, or PROC3 on its command line, regardless of capitalization. This technique is also useful when I want a consistent display format.

I don't remember ever seeing this method published. I can't imagine why this is so or why I never thought of it before, since it's so fundamental.

*Thomas G. Lavedas
Clifton, Virginia*

► **PC MAGAZINE:** Using the PATH command to capitalize strings isn't new, but we haven't discussed it in User-to-User in a while. PATH capitalizes an argument before storing it in the path environment variable. To make use of this in a batch file, you simply have to save and restore the existing value of the path variable.

Unfortunately, there are two minor problems with CAPITAL.BAT's solution of copying the path to another environment variable. First, if there's not enough environment space available to make the copy, CAPITAL.BAT will end up cutting the copy of the path short. When it restores the path, it will restore a truncated copy.

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```
@ECHO OFF
IF [%1]==[] GOTO End
:: Save the current path string to a new environment variable
SET !P=%PATH%
:: Pass the string as the argument to the PATH command
PATH %1
:: Save the newly capitalized string for later use
SET !S=%PATH%
:: Restore the path to its original value
PATH %!P%
ECHO The capitalized string is %!S%
SET !P=
:End
```

Figure 1: CAPITAL.BAT capitalizes its command line parameter using the PATH command.

```
@ECHO OFF
IF [%1]==[] GOTO ERROR
:: ---- Capitalization
SET !P=%PATH%
PATH %1
SET !S=%PATH%
PATH %!P%
SET !P=
:: ----
SET LABEL=ERROR
FOR %%I IN (PROC1 PROC2 PROC3) DO IF '%%I'=='%!S%' SET LABEL=%%I%
GOTO %LABEL%
:ERROR
ECHO ERROR - enter %% followed by PROC1, PROC2, or PROC3
GOTO End
:PROC1
ECHO Executing Procedure 1...
GOTO End
:PROC2
ECHO Executing Procedure 2...
GOTO End
:PROC3
ECHO Executing Procedure 3...
:End
```

Figure 2: PROC.BAT shows how capitalizing strings can help validate command line parameters.

```
@ECHO OFF
IF [%1]==[] GOTO End
:: Save the current path string to a temporary batch file
PATH>TEMPPATH.BAT
:: Pass the string as the argument to the PATH command
PATH %1
:: Save the newly capitalized string for later use
SET !S=%PATH%
:: Restore the path to its original value
CALL TEMPPATH.BAT
DEL TEMPPATH.BAT
ECHO The capitalized string is "%!S%"
:End
```

Figure 3: To avoid possible problems with low environment space or very long paths, CAPITAL2.BAT stores the old path on disk.

The second problem is more subtle. A DOS command line can have at most 127 characters, and PATH= takes 5, so the path is limited to 122 characters. A command to copy the path to another variable, however, takes a minimum of 6 characters (SET V=) plus the length of the path. Each character added to the length of the variable name reduces by 1 the maximum length of the path that can be copied. If the path variable is close to its maximum possible length, saving and restoring it may cut off the last few characters.

On a system that has plenty of free environment space and a path that's nowhere near its maximum length, these problems needn't worry you. If you're

cautious, however, you can store the old path on-disk instead of in a spare environment variable, as Figure 3 shows. The line PATH>TEMPPATH.BAT creates a temporary batch file whose single line consists of the output of the PATH command with no parameters. This line has the form PATH= followed by the current path. To restore the path, CAPITAL2.BAT simply CALLs this temporary batch file, and then deletes it. Note that CAPITAL2.BAT requires DOS 3.3 or later, because the essential CALL command wasn't available in earlier versions.

You can download these batch files from PC MagNet's Utilities/Tips Forum, archived as CAPITA.ZIP. □



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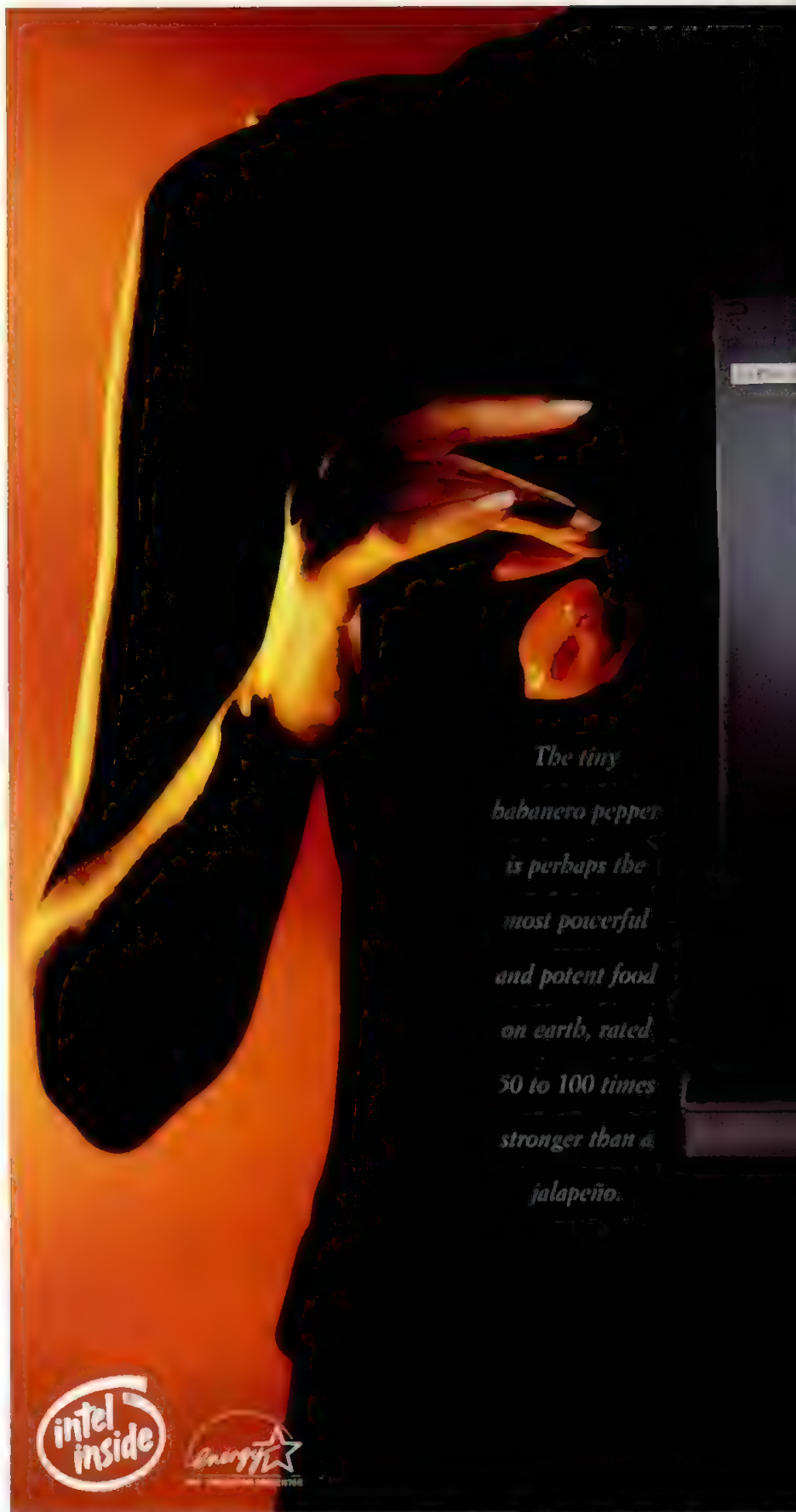
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BY JEFF PROSISE

Make Your Digital Images Shine

There are many ways to capture images on a computer. With a scanner, you can scan hard-copy photographs, convert them to bitmapped images, and then store those images on your hard disk. With a digital camera such as Apple's recently introduced QuickTake 100, you can capture images directly. If you have neither a scanner nor a digital camera but have access to a conventional film camera and a CD-ROM drive, you can snap your pictures and send them off for Kodak Photo CD processing: You'll get back a CD containing the images ready to be read into your computer.

Soon after you discover the joys of digital-image capture, you'll probably discover image-processing programs, too. Software packages such as Adobe Photoshop and Aldus PhotoStyler let you bring out the best in your photographs. Is a picture overexposed? No problem: With image-processing software to lend a hand, you can adjust the exposure level after the fact. If a photograph is blurry or out of focus, you can sharpen it using a simple digital-filtering process. You can even apply special effects such as embossing, which transforms an image so that it appears to stand out in relief on a metallic surface. Digital images can be manipulated in ways that paper images can't—a fact that has given rise to a whole new genre of software capable of performing miraculous feats with your pictures.

You shouldn't be surprised to learn that a typical image-processing program uses a variety of algorithms and pixel-transformation techniques. But what might come as a surprise is that the algorithms underlying many image-processing

effects are very simple. Take embossing, for example. Although the image transformation is rather complex, the algorithm that drives the transformation is exceedingly simple, and slightly modified versions of the algorithm can be used for blurring and sharpening. All three effects are examples of *digital filtering*, which modifies the color of each pixel in an image according to rules that consider the colors of neighboring pixels.

To understand how digital filtering works, we'll look at sharpening, blurring, and embossing from the bird's-eye view of a professional image-processing program. If you have a copy of Adobe Photoshop or a similar program on hand, you can follow along with the examples and modify them to mold enhanced images of your own.

SHARPENING AND BLURRING Sharpening and blurring are classic examples of digital-filtering effects. Blurring diffuses the colors in an image, softening hard edges much like a diffusion filter on a camera. Sharpening does the reverse, increasing the contrast between adjacent pixels to enhance hard-to-see details.

The key ingredient in both is an array of numbers called a *convolution kernel*. The array size is typically 3 by 3, 5 by 5, or 7 by 7. To keep things simple, we'll work with 3-by-3 kernels exclusively. Each of the nine slots in a 3-by-3 kernel

holds a coefficient. To process a pixel in an image, the kernel is placed over a group of 9 pixels with the target pixel in the center. The color value associated with each of the 9 pixels is multiplied by the corresponding coefficient in the array. The products are added together, and the sum becomes the new color value for the target pixel. (For color images, red, green, and blue color values are processed separately.) Performing this procedure on every pixel processes, or filters, the entire image. The order in which pixels are processed is unimportant. Filtered pixel values are stored in a separate bitmap so that they won't affect the values input for subsequent pixels.

The values of the kernel coefficients determine what effect the filtering process will have. Figure 1 shows what a 3-by-3 sharpening kernel might look like, and its effect on a pixel. The 5 in the center of the kernel and the surrounding -1s serve to heighten the contrast between the center (target) pixel and its neighbors. In the simple case of a pixel whose color is 11 surrounded by pixels whose color is 10, the filtering process bumps the 11 up to 15, increasing the difference between the center pixel and its neighbors to 5. Notice that the sum of the kernel coefficients is 1. It's important to choose coefficients whose sum is 1 to prevent the brightness of the image as a whole from being increased or decreased.

Images A and B in the sidebar "Digitally Filtered Images" show the effects that this kernel has on a sample image

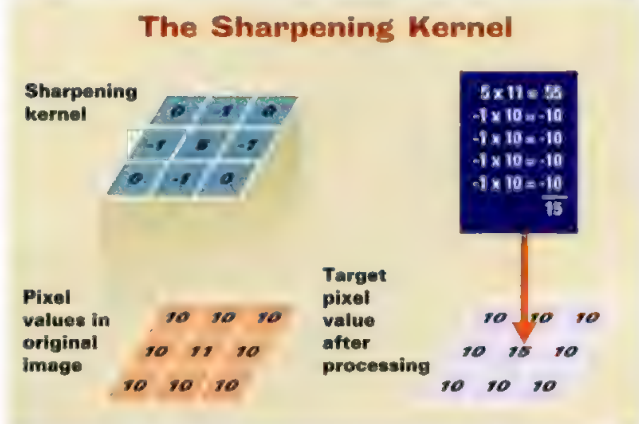
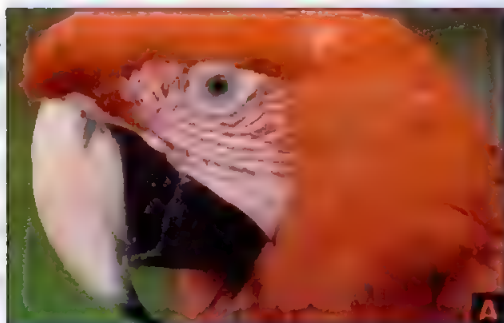
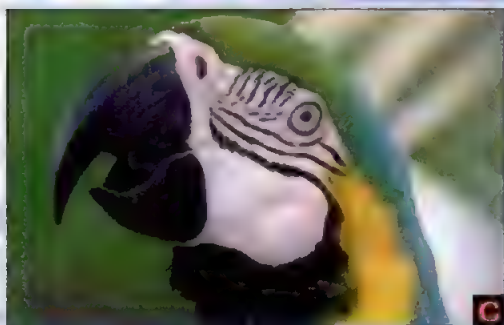


Figure 1: Sharpening increases the contrast between adjacent pixels of different colors. A 3-by-3 kernel multiplies the values of the target pixel and its eight neighbors by the corresponding kernel coefficients. The sum of the products is assigned to the target pixel.

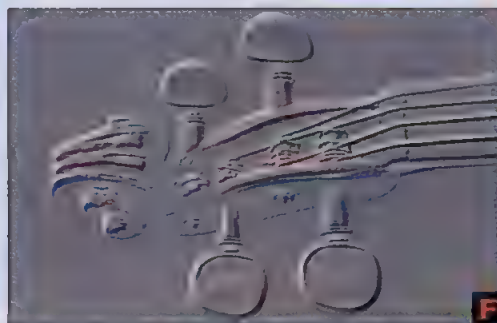
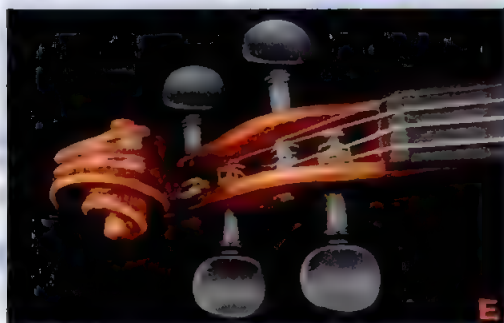
Digitally Filtered Images



The image on the left (A) was processed using the sharpening kernel in Figure 1. The result is the image on the right (B).



The image on the left (C) was processed using the blurring kernel in Figure 2. The result is the image on the right (D).



The image on the left (E) is distributed with Aldus PhotoStyler. Embossing transforms an image so that contours appear to be raised in relief against a gray background (F).

taken from the Kodak Photo Sampler. The after image is clearly crisper than the before image. The extra detail wasn't manufactured out of thin air. It was there all along; you just couldn't see it. This is one of the image-enhancement techniques used to sharpen images transmitted from satellites.

To achieve this transformation in Adobe Photoshop, load an image file and select Filter | Other | Custom from the main menu. (If the image isn't a true-color image, first choose RGB Color from the Mode menu to convert the image to 24-bit color.) Enter the values shown and click OK to apply the filter to the image. Experiment with different kernel coefficients

to see what effect they have on the picture, remembering to constrain the coefficients' sum to 1.

The only difference between sharpening and blurring is the kernel coefficients that you use. Figure 2 shows a sample blurring kernel, along with the equivalent entries in Photoshop's Custom dialog box. Images C and D in the sidebar above show the effect that this filter has on an image. Using this kernel, a pixel whose color is 100 surrounded by pixels whose color is 25 would be calculated as follows:

$(100 * 0.24) + (4 * (25 * 0.12)) + (4 * (25 * 0.7))$, which comes to 43—lessening the contrast between this pixel and its neighbors.

Notice the scaling factor of 100 in the dialog box's Scale field. Photoshop won't

The Blurring Kernel

.07	.12	.07
.12	.24	.12
.07	.12	.07

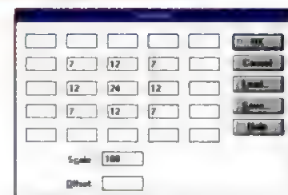


Figure 4: The kernel on the left and the equivalent Photoshop filter on the right produce a blurring effect.

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accept noninteger coefficient values, so .24 must be entered as 24 with a scaling factor of 100. This makes the filtering process more efficient by allowing Photoshop to perform its math using only integer values. The sum of the kernel products is divided by the scaling factor to arrive at a final pixel value.

The amount of blurring can be increased by tweaking the kernel to decrease the value of the center coefficient, thereby diffusing colors over a wider range with a larger kernel or filtering the image with Figure 2's blurring kernel several times.

EMBOSSING Embossing involves two operations on every pixel. First, each pixel is processed with a special edge-detection kernel that highlights "edges" in the image (areas where the contrast between neighboring pixels is high). Then, 128 is added to the resulting value, brightening the pixel. If the sum exceeds 255, it can be capped at 255 or reduced by 255 so that it wraps around to a smaller value. Through this process, an image is transformed so that it looks like an embossed metal

plaque, as shown in images E and F in the sidebar.

Figure 3 shows the setup for the embossing process in Photoshop. The kernel contains just two nonzero numbers—a -1 above and to the left of the center pixel and a 1 below and to the right. The sum of the coefficients is 0, which forces many of the pixels in the image—pixels that do not lie along edges—to become 0, or black. (To prove this to yourself, take out a piece of paper and evaluate the effect that this kernel has on a block whose left and right halves contain pixels of contrasting colors.) The 128 specified in the Offset field converts black pixels to gray and other pixels to colors that contrast with gray. In this example, light is cast from the upper-left-hand corner of the scene. You can reverse its direction by swapping the positions of the 1 and -1 in the kernel.

Filtering with convolution kernels is a powerful technique, but it is by no means

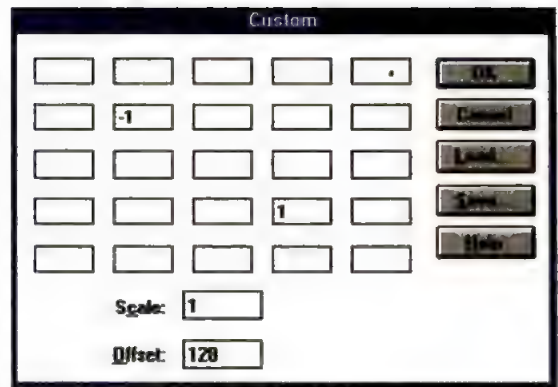


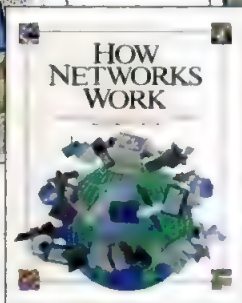
Figure 3: This Photoshop filter produces the embossing effect illustrated in images E and F in the sidebar.

the last word in digital-image processing. Other types of filters have equally useful and sometimes more dramatic effects on an image. Median filters, which set a target pixel to the median value of its neighbors, are great for smoothing out noisy, speckled images. Spatial filters move pixels to add special effects such as ripples, waves, and swirls. Whatever your image-processing need, there's probably a filter for it. □

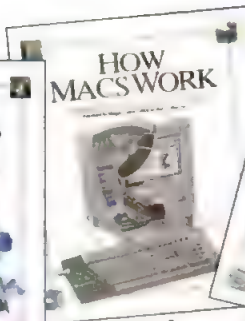
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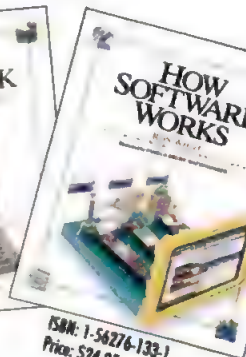
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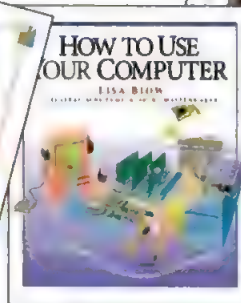
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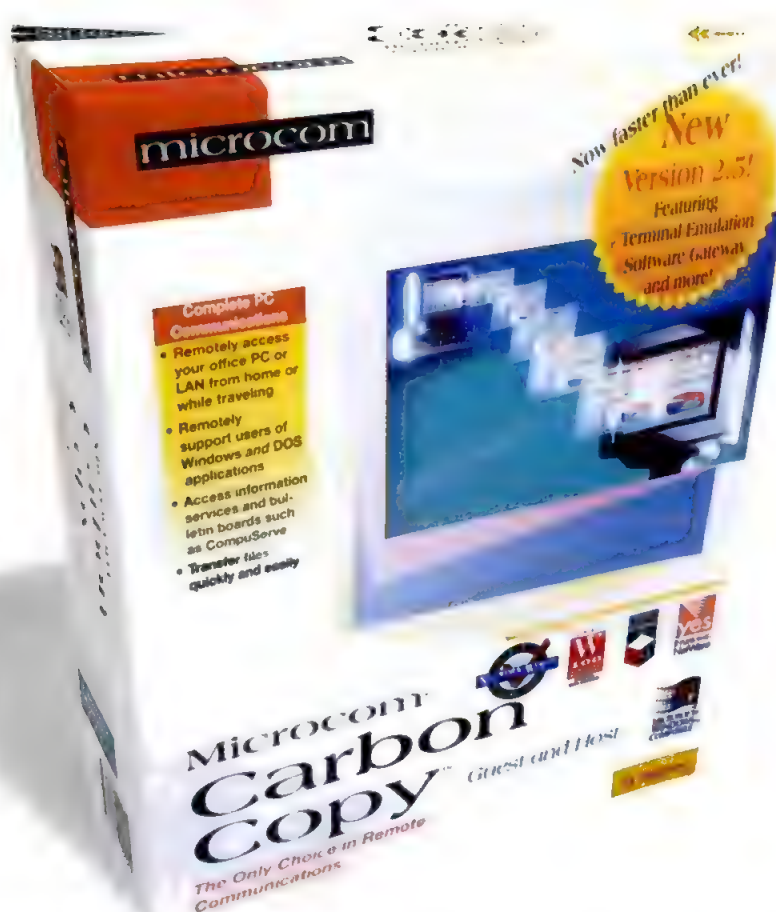
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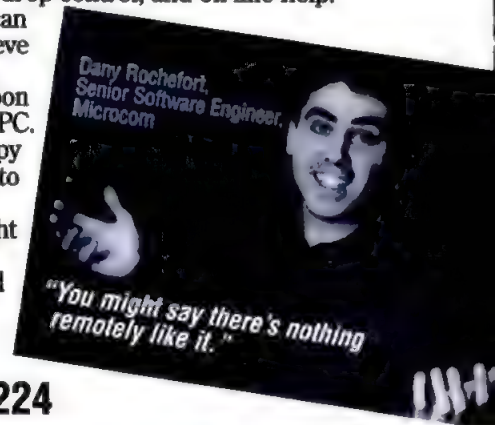
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Toolkits

BY PETER G. AITKEN

A Slick New Editor

If you find that the editor provided with your compiler is less than ideal, you will be glad to know about Visual SlickEdit for Windows, Version 1.5 (\$295), a programming editor available for Microsoft Windows 3.1 and for Microsoft Windows NT on DEC Alpha AXP, MIPS, and x86 platforms. (We looked at the Windows 3.1 version.) SlickEdit provides impressive editing capabilities, a powerful macro language, and an unprecedented degree of flexibility. It also has a capable file manager, along with other features too numerous to mention.

A SLICK EDITOR SlickEdit offers just about every editing goody you can imagine: regular expression-based search-and-replace, program-statement completion, color coding of syntax elements, automatic indentation, and a pop-up calculator that can operate in decimal, binary, octal, or hexadecimal format. You can open the same file in multiple windows to view and edit different parts simultaneously. Multiple clipboards simplify the moving and copying of text. Word processing features include background printing, justification, margins, spell-checking, and word wrap. You can undo or redo an essentially unlimited number of steps (over 32,000). The search-and-replace commands can operate across multiple files and directories. To edit long files more quickly, you can edit the last page or any part of a file without loading the entire file.

SlickEdit uses a device called *tags* to locate parts of your source code quickly. You can tag routines in assembly, C/C++, COBOL, dBASE, FORTRAN, Modula-2, Pascal, and SlickEdit's own macro language. In C/C++, you can also tag classes,

enums, structs, typedefs, unions, or #define constants. Once your tags are set up, you need only place the cursor on an identifier and issue the Push Tag command to move instantly to the routine or variable definition. SlickEdit keeps track of your route so that you can back out by the same path.

You can compile from SlickEdit with Microsoft or Borland C++. Support for other packages can be added by editing an ASCII configuration file so that it contains the needed compiler command lines. Editing can continue while your program compiles. Though compilation is in the background, you can interrupt it at any time with a Break Process command. After compiling, you can jump to problem areas within your source code with the Next Error command.

A RICH MACRO LANGUAGE SlickEdit's powerful macro language, called Slick-C, is a typeless, interpreted pseudo-code language in the C/C++ style that was used to write many of the program's features, an important key to its flexibility. Slick-C offers programmer-friendly features such as the ability to break out of infinite loops by pressing Ctrl-Alt-Shift. An intelligent

macro recorder converts your actions into Slick-C code. Over 800 macro functions are provided, including string manipulation, search-and-replace, clipboard actions, and the ability to shell out to DOS and Windows programs. Macro code can be transferred without modification among the SlickEdit platforms.

You can create graphical front ends for your macros with the dialog box editor, which is similar to Microsoft Visual Basic: You drag and drop controls from a palette to your dialog box form and then attach event-handling code. Many controls are offered, including gauges and spin boxes. You can inherit features from an already-written control by simply copying it. The code from the original control is included in the copy, and if you change the code in the original, the copy is changed, too.

If SlickEdit's rich feature set sounds daunting, don't worry. The program is very well documented, and the entire 593-page manual is also available in on-line help with dynamic links.

Not everything here is slick. Some dialog boxes are horribly overcrowded, and help text is not ideally arranged, but these are minor quibbles. SlickEdit is an excellent product with many capabilities that programmers really need.

► **Visual SlickEdit for Windows, Version 1.5.** List price: \$295 for the first platform, \$99 for additional platforms. Requires: 386-based PC or better, 4MB RAM (6MB recommended), 6MB hard disk space, Microsoft Windows 3.1 or higher. MicroEdge Inc., P.O. Box 18038, Raleigh, NC 27619-8038; 800-934-3348, 919-790-1691; fax, 919-872-5586.

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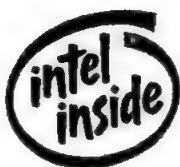
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Environments

BY CHARLES PETZOLD

Inside the Windows NT Enhanced Metafile

Some day we may have a single file format for data that describes visual imagery. That seems just about impossible right now. We don't even have a single file format for representing text (aside from the all-purpose plain-ASCII format, of course).

The big problem with visual imagery is that we haven't yet discovered how to reconcile the vastly disparate worlds of raster graphics (the representation of images as grids of pixels, stored in bitmap files) and vector graphics (the representation of images using lines, filled areas, and text, stored in metafiles). This reconciliation will probably require fractal mathematics and minds much brighter than mine to figure out how to do it well.

We have a number of different file formats for bitmaps, including the Windows device-independent bitmap (DIB), the Graphics Interchange Format (GIF) popularized on CompuServe, the .PCX format used in the ZSoft PC Paintbrush programs, the Tagged Image File Format (TIFF), and several others. These bitmap formats can generally be translated among each other. Metafiles are something else altogether.

THE METAFILE A metafile is a collection of graphics commands that describe an image. Most often, these graphics commands involve drawing lines, areas, and text with various attributes. (Metafiles can also include embedded bitmaps, by the way, but that does not imply they have reconciled the worlds of vector graphics

and raster graphics.)

Because of their very nature, metafiles are closely tied to the graphics system in which they originate. This is because the commands encoded in a metafile correspond to the function calls offered by the particular graphics programming system.

Perhaps the most sophisticated metafile format is PostScript, although it's not usually categorized as such. In essence, PostScript uniquely combines a graphics programming language (and a general-purpose programming language) with a graphics file format. They're all the same thing. The PostScript language is represented by ASCII text. Most other metafile formats are in a binary form. Basically, they consist of records, each of which corresponds to a graphics programming command and its parameters.

Metafiles have been supported by the Windows Graphics Device Interface (GDI) since the early days, but as I mentioned in the last issue, they lacked essential header information describing the size of the image (either metrically or in pixel dimensions). As I also noted, Windows NT supports the enhanced metafile format (EMF). The enhanced metafile goes a long way toward correcting the deficiencies of the earlier metafile format, and it's time to see how.

WINDOWS NT METAFILE BASICS In the last issue, I demonstrated how to create a simple metafile under Windows NT. The EMF1 program presented in that issue creates a metafile in its window procedure during the WM_CREATE message. It first calls CreateEnhMetaFile to obtain a handle to a metafile device context. It then makes several graphics calls using this handle. These graphics calls are not rendered but instead are stored in memory. The EMF1 program finishes WM_CREATE processing by calling CloseEnhMetaFile, which returns a handle to the metafile. The program stores this handle in a static variable.

During the WM_PAINT message, the EMF1 program calls PlayEnhMetaFile using a device-context handle to the program's client area, the metafile handle, and a RECT structure indicating the rectangle in which the image is to appear.

This function renders the drawing commands stored in the metafile by displaying the image on the client area.

Finally, during the WM_DESTROY message, EMF1 gets rid of the metafile by calling DeleteEnhMetaFile.

This is the simple approach. Although CreateEnhMetaFile

takes four parameters, the EMF1 program sets all of them to NULL. This method creates the metafile in memory, not on disk, and results in other default activity, which I'll discuss shortly. This time, we'll look at EMF2 (shown in Figures 1 and 2), a program that creates a disk-based metafile.

If you have the Windows NT Software Development Kit installed, you can create EMF2.EXE by running

```
NMAKE EMF2.MAK
```

on a command line. Or you can download the source code and executable from PC MagNet's Programming Forum, archived as EMF2.ZIP.

CREATING THE METAFILE The first function involved with creating a metafile is CreateEnhMetaFile. This function has

*The Windows NT
enhanced metafile
goes a long way toward
correcting the deficiencies
of the earlier metafile
format.*


```
#-----
# EMF2.MAK make file
#-----

!include <ntwin32.mak>

emf2.exe : emf2.obj
    $(link) $(guiflags) -out:emf2.exe emf2.obj $(guilibsmt)

emf2.obj : emf2.c
    $(cc) $(cflags) $(cvarsmt) emf2.c
```



Figure 1: EMF2.MAK facilitates compiling and linking the EMF2 program.

four parameters, all of which are optional and can be set to NULL (as in EMF1).

The first parameter is a device-context handle. GDI uses this parameter to insert metrical information in the metafile header, as we'll see shortly. If the parameter is set to NULL, GDI assumes that this metrical information is based on the video device context.

The second parameter to CreateEnhMetaFile is a filename. If you set this parameter to NULL (as EMF1 does), the function creates a memory metafile. EMF2 creates a disk-based metafile with the name EMF2.EMF. (The .EMF extension

is recommended for enhanced metafiles.)

The third parameter to the function is an address of a RECT structure that indicates the total dimensions of the metafile. This piece of vital information (the lack of which was one of the deficiencies of the earlier Windows metafile format) goes into the metafile header, as we'll see shortly. If you set this parameter to NULL, GDI will figure out the dimensions for you. I like the idea of operating systems doing things for me, so I've set the parameter to NULL. If performance is critical in your application, you might want to use this parameter to avoid some

extraneous work on GDI's part.

Finally, the last parameter is a text string describing the metafile. You format this text string in two pieces: The first piece is the name of the application (not necessarily the program filename) followed by a NULL character; the second piece describes the visual image and is followed by two NULL characters. For example, using the C notation of \0 for a NULL character, the description string could be

```
"HemiDemiSemiCad V6.4\0Flying
Frogs\0\0"
```

Because C normally puts a NULL character at the end of quoted strings, you need only one \0 at the very end, as EMF2 demonstrates.

After creating the metafile, EMF2 proceeds as EMF1 does by issuing a few GDI function calls using the device-context handle returned from the CreateEnhMetaFile function. These functions draw a rectangle and two lines connecting the opposite corners of the rectangle. The

```
/*-----
EMF2.C -- Enhanced Metafile Demo #2
(c) Charles Petzold, 1994
-----*/

#include <windows.h>

LRESULT CALLBACK WndProc (HWND, UINT, WPARAM, LPARAM) ;

int WINAPI WinMain (HINSTANCE hInstance, HINSTANCE hPrevInstance,
    LPSTR lpszCmdLine, int nCmdShow)
{
    static char szAppName[] = "EMF2" ;
    HWND        hwnd ;
    MSG         msg ;
    WNDCLASS    wndclass ;

    wndclass.style           = CS_HREDRAW | CS_VREDRAW ;
    wndclass.lpfnWndProc     = WndProc ;
    wndclass.cbClsExtra      = 0 ;
    wndclass.cbWndExtra      = 0 ;
    wndclass.hInstance       = hInstance ;
    wndclass.hIcon           = LoadIcon (NULL, IDI_APPLICATION) ;
    wndclass.hCursor         = LoadCursor (NULL, IDC_ARROW) ;
    wndclass.hbrBackground   = GetStockObject (WHITE_BRUSH) ;
    wndclass.lpszMenuName    = NULL ;
    wndclass.lpszClassName   = szAppName ;

    RegisterClass (&wndclass) ;

    hwnd = CreateWindow (szAppName, "Enhanced Metafile Demo #2",
        WS_OVERLAPPEDWINDOW,
        CW_USEDEFAULT, CW_USEDEFAULT,
        CW_USEDEFAULT, CW_USEDEFAULT,
        NULL, NULL, hInstance, NULL) ;

    ShowWindow (hwnd, nCmdShow) ;
    UpdateWindow (hwnd) ;

    while (GetMessage (&msg, NULL, 0, 0))
    {
        TranslateMessage (&msg) ;
        DispatchMessage (&msg) ;
    }
    return msg.wParam ;
}

LRESULT CALLBACK WndProc (HWND hwnd, UINT message, WPARAM wParam, LPARAM
    lParam)
{
    HDC        hdc, hdcEMF ;
```

```
HENHMETAFILE hemf ;
PAINTSTRUCT ps ;
RECT         rect ;

switch (message)
{
    case WM_CREATE:
        hdcEMF = CreateEnhMetaFile (NULL, "emf2.emf", NULL,
            "EMF2\0EMP Demo #2\0") ;

        Rectangle (hdcEMF, 100, 100, 200, 200) ;

        MoveToEx (hdcEMF, 100, 100, NULL) ;
        LineTo (hdcEMF, 200, 200) ;

        MoveToEx (hdcEMF, 200, 100, NULL) ;
        LineTo (hdcEMF, 100, 200) ;

        hemf = CloseEnhMetaFile (hdcEMF) ;

        DeleteEnhMetaFile (hemf) ;
        return 0 ;

    case WM_PAINT:
        hdc = BeginPaint (hwnd, &ps) ;

        GetClientRect (hwnd, &rect) ;

        rect.left  = rect.right / 4 ;
        rect.right = 3 * rect.right / 4 ;
        rect.top   = rect.bottom / 4 ;
        rect.bottom = 3 * rect.bottom / 4 ;

        hemf = GetEnhMetaFile ("emf2.emf") ;

        PlayEnhMetaFile (hdc, hemf, &rect) ;

        DeleteEnhMetaFile (hemf) ;

        EndPaint (hwnd, &ps) ;
        return 0 ;

    case WM_DESTROY:
        PostQuitMessage (0) ;
        return 0 ;
}

return DefWindowProc (hwnd, message, wParam, lParam) ;
}
```



Figure 2: EMF2.C shows how to create and display a disk-based metafile.

There's



on the keyboard,

there's a



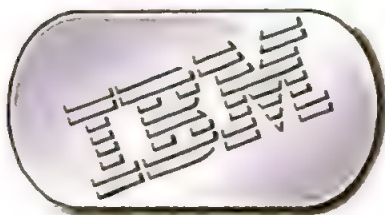
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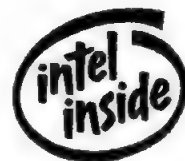
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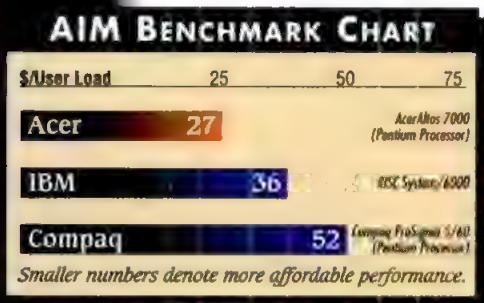


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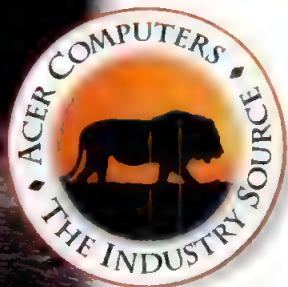
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CIRCLE 087 ON READER SERVICE CARD

program then calls `CloseEnhMetaFile` to destroy the device- context handle and obtain a handle to the completed metafile.

Then, still during `WM_CREATE` processing, `EMF2` does something `EMF1` does not: Right after obtaining the metafile handle, the program deep-sixes the metafile by means of `DeleteEnhMetaFile`. This gets rid of all memory resources required to maintain the metafile, but the disk-based metafile remains intact. (If you ever want to get rid of that file, use a normal file-deletion function.) Notice that the metafile handle is not stored as a static variable as in `EMF1`, which implies that it is not required to be saved between messages.

Now, in order to use that metafile, `EMF2` needs to access the disk file. It does this during the `WM_PAINT` message by calling `GetEnhMetaFile`. The single parameter to the function is the metafile filename, and the function returns a handle to the metafile. `EMF2` passes this handle to `PlayEnhMetaFile`, just as `EMF1` does. The metafile image is displayed in the rectangle described by the last parameter to the function. But unlike `EMF1`, `EMF2` deletes the metafile before concluding `WM_PAINT` processing. During any following `WM_PAINT` messages, `EMF2` gets the metafile again, plays it, and deletes it.

Keep in mind that deleting the metafile involves deleting only the memory resources required to maintain the metafile. The disk-based metafile stays behind, even after the program has concluded execution.

LOOKING AT THE METAFILE Because `EMF2` leaves behind a disk-based metafile, we can take a look at it. Figure 3 shows a simple hexadecimal dump of the `EMF2.EMF` file that the program creates. The Windows NT enhanced metafile consists of variable-length records. The general format of these records is described by the `ENHMETARECORD` structure, defined in the `WINGDI.H` header file:

```
typedef struct tagENHMETARECORD
{
    DWORD iType ;
    DWORD nSize ;
    DWORD dParm [1] ;
}
ENHMETARECORD ;
```

Anytime you see a structure field that is an array of one element (like the `dParm` field here), it really indicates a variable number of array elements. That is, the number of parameters depends on the record type.

The `iType` field can be one of nearly 100 constants beginning with the prefix `EMR_` that are defined in the `WINGDI.H` file. The `nSize` parameter is the size of the total record, including the `iType` and `nSize` fields, and one or more `dParm` fields.

With this knowledge, let's look at Figure 3. The first field has a type of `0x00000001` and a size of `0x0000007C`, so

```
0000 01 00 00 00 7C 00 00 00 64 00 00 00 64 00 00 00 64 00 00 00
0010 C8 00 00 00 C8 00 00 00 A6 0E 00 00 A6 0E 00 00 .....
0020 4C 1D 00 00 4C 1D 00 00 20 45 4D 46 00 00 01 00 L...L... EMF...
0030 E8 00 00 00 07 00 00 00 01 00 00 00 12 00 00 00 .....
0040 58 00 00 00 00 00 00 00 80 02 00 00 E0 01 00 00 X.....
0050 F0 00 00 00 B4 00 00 00 45 00 4D 00 46 00 32 00 .....E.M.F.2.
0060 00 00 45 00 4D 00 46 00 20 00 44 00 65 00 6D 00 ..E.M.F. .D.e.m.
0070 6F 00 20 00 23 00 32 00 00 00 00 00 2B 00 00 00 o. .#.2.....+...
0080 18 00 00 00 64 00 00 00 64 00 00 00 C7 00 00 00 ....d...d.....
0090 C7 00 00 00 1B 00 00 00 10 00 00 00 64 00 00 00 .....d...
00A0 64 00 00 00 36 00 00 00 10 00 00 00 C8 00 00 00 d...6.....
00B0 C8 00 00 00 1B 00 00 00 10 00 00 00 C8 00 00 00 .....
00C0 64 00 00 00 36 00 00 00 10 00 00 00 64 00 00 00 d...6.....d...
00D0 C8 00 00 00 0E 00 00 00 14 00 00 00 00 00 00 00 .....
00E0 10 00 00 00 14 00 00 00 .....
```

Figure 3: Here is a hexadecimal dump of the `EMF2.EMF` file created by the `EMF2` program.

it occupies the first 124 bytes of the file. A record type of 1 is the constant `EMR_HEADER`. I want to leave the discussion of the header for later, so for now let's just skip to offset `0x007C`, the beginning of the next record.

The next five records correspond to the five GDI calls that `EMF2` makes after creating the metafile. The record at offset `0x007C` has a type code of `0x0000002B`, which is `EMR_RECTANGLE`—obviously the metafile record for the Rectangle call. It has a length of `0x00000018` (24 in decimal) bytes to accommodate four 32-bit parameters. The Rectangle function has five parameters, but the first (the handle to the device context) is not stored in the metafile because it is meaningless. There are two parameters of `0x00000064` (or 100) and two parameters of `0x000000C7` (or 199). Although the function call in `EMF2` specifies that the lower-left corner of the Rectangle is (200,200), GDI is apparently compensating for the way that the coordinates are used as a bounding rectangle.

Next, we have four 16-byte records corresponding to the two `MoveToEx`

(`0x0000001B` or `EMR_MOVETOEX`) and `LineTo` (`0x00000036` or `EMR_LINETO`) calls.

The metafile ends with a type code of `0x0000000E` or `EMR_EOF` (end of file). This is a 20-byte record and seems to contain some information, but as far as I've been able to determine, the information's meaning is undocumented.

THE METAFILE HEADER The enhanced metafile always begins with a header record. This corresponds to a structure of type `ENHMETAHEADER`, the definition of which is shown in Figure 4. The existence of this header record is the single

greatest improvement (perhaps the only improvement, but important nonetheless) of the Windows NT enhanced metafile format over the old Windows metafile. In the metafile, the header record includes the description string originally specified in the `CreateEnhMetaFile` call tacked onto the end.

You don't need to access the actual disk-based metafile to obtain this header information. If you have a handle to the metafile, you can use the `GetEnhMetaFileHeader` function

```
GetEnhMetaFileHeader (hemf,
    cbSize, &emh) ;
```

The first parameter is the metafile handle, the last is a pointer to an `ENHMETAHEADER` structure, and the second is the size of this structure. You can use the similar `GetEnhMetaFileDescription` function to obtain the description string.

THE HEADER FIELDS Normally the `ENHMETAHEADER` structure is 88 bytes in length, but in the metafile the size of the record includes the description string, so the size is `0x0000007C` or 124.


```
typedef struct tagENHMETAHEADER
{
    DWORD    iType ;
    DWORD    nSize ;
    RECTL    rclBounds ;
    RECTL    rclFrame ;
    DWORD    dSignature ;
    DWORD    nVersion ;
    DWORD    nBytes ;
    DWORD    nRecords ;
    WORD     nHandles ;
    WORD     sReserved ;
    DWORD    nDescription ;
    DWORD    offDescription ;
    DWORD    nPalEntries ;
    SIZEL    szlDevice ;
    SIZEL    szlMillimeters ;
}
ENHMETAHEADER ;
```

Figure 4: The ENHMETAHEADER structure describes the header section of an enhanced metafile.

The `rclBounds` field is a `RECT` structure that indicates the size of the image in pixels. Translating from hexadecimal, we see that the image is bounded by the points (100,100) on the upper left and (200,200) on the lower right, exactly what we would expect.

The `rclFrame` field is another rectangle structure that provides the same information, but in units of 0.01 millimeters. In this case, the file shows a bounding rectangle of (0x0EA6,0x0EA6) by (0x1D4C,0x1D4C) or, in decimal, (3750,3750) by (7500,7500). Where does this information come from? We'll see shortly.

The `dSignature` field is always the value `ENHMETA_SIGNATURE` or 0x464D4520. That seems like a strange number, but if you reverse the byte ordering (in accordance with how multibyte values are stored in memory with Intel processors) and convert to ASCII, it's simply the string "EMF". The `dVersion` field is always 0x00010000, at least for the first version of Windows NT.

This is followed by the `nBytes` field, which in this case is 0x000000E8, the total byte size of the metafile. The `nRecords` field (in this case 0x00000007) indicates the number of records—the header record, the five GDI function calls, and the end-of-file record.

Next, we have two 16-bit fields. The `nHandles` field is 0x0001. Normally this field would indicate the number of non-default handles to graphics objects (such as pens, brushes, and fonts) used in the metafile. Since we haven't used any, you

might expect the first field to be 0; but GDI reserves that field for itself. We'll see how handles are stored in metafiles in the next Environments column.

The `sReserved` field is always 0x0000, at least in the first version of Windows NT. The next two fields indicate the length of the description string in characters and its offset within the file, in this case 0x00000012 (18 in decimal) and 0x00000058. If the metafile did not have a description string, both these fields would be 0.

If you add together the size of the `ENHMETAHEADER` structure (0x58 or 88 bytes) and the length of the description string (0x12 or 18 characters), and compare that with the total size of the metafile header in `EMF2.EMF` (0x7C or 124 bytes), we seem to have a discrepancy. I'll explain in a moment.

The `nPalEntries` field indicates the number of entries in the metafile's palette table, in this case none.

Finally, the header record concludes with two `SIZEL` structures, which are the same as `SIZE` structures and contain two 32-bit fields, `cx` and `cy`. The `szlDevice` field indicates the size of the output device in pixels, and `szlMillimeters` is the size of the output device in millimeters.

In the documentation on the enhanced metafile, this output device is called the *reference device*. It is based on the device context indicated by the handle passed as the first parameter to the `CreateEnhMetaFile` call. If the parameter is set to `NULL`, GDI uses the video display. I happened to be running `EMF2` on a standard VGA, so that's what GDI used as the reference device.

GDI obtains this information from `GetDeviceCaps`. The `szlDevice` field in `EMF2.EMF` is 0x0280 by 0x01E0, otherwise known as the familiar 640 by 480, which is obtained from `GetDeviceCaps` using the `HORZRES` and `VERTRES` parameters. The `szlMillimeters` field is 0xF0 by 0xB4, or 240 by 180—the size in millimeters of a standard VGA display (probably one that an anonymous Microsoft programmer had in his office), obtained from `GetDeviceCaps` using the `HORZSIZE` and `VERTSIZE` parameters.

Simple division reveals that the pixels on a VGA display are 0.375 millimeters high and wide, which is how GDI figures

out the dimensions of the `rclFrame` rectangle described above.

We've reached the end of the `ENHMETAHEADER` structure, which is followed in the metafile by the description string—the last parameter to `CreateEnhMetaFile`. In this example, the description string is "EMF2" followed by a `NULL` character and "EMF Demo #2" followed by two `NULL` characters. That's a total of 18 characters.

If you're scratching your head about why a zero byte seems to be inserted between every character byte and why the description string requires 36 bytes rather than 18, you probably missed my series on Unicode that ran in this spot towards the end of last year. As a quick review, Unicode is a system for encoding characters using 16 bits rather than 8 bits, thus allowing the representation of all the characters of the world's written languages. The ASCII character set is the first 128 characters of the Unicode character set, so these are encoded as zero bytes preceding the usual ASCII codes.

As I frequently mentioned in that series of articles last year, Windows NT supports Unicode from the ground up. Storing the description string of a metafile in Unicode is an example of that support. This means that the description string can contain characters in Russian, Arabic, Hebrew, Kanji, and so forth. The `nDescription` field of the metafile header indicates the number of *characters* in the description string. The number of bytes required for storing the string is double that amount, in this case 36. That reconciles the addition problem mentioned above.

The `dSignature` field is not in Unicode (because it's a constant) and always represents the ASCII string "EMF" without any need for Unicode.

REAL LIFE AND REAL PROGRAMS Of course, the `EMF2` program is just a piece of sample code that lets us look at a simple metafile and understand how it's structured. In real life, the same program would not be creating a metafile on-disk and then loading it from the disk to display it. In real life, you use metafiles as interchange formats. You can pass memory metafiles through the clipboard and use disk-based metafiles as collections of clip art.

Next time, we'll dig deeper into enhanced metafiles and how to use them. □

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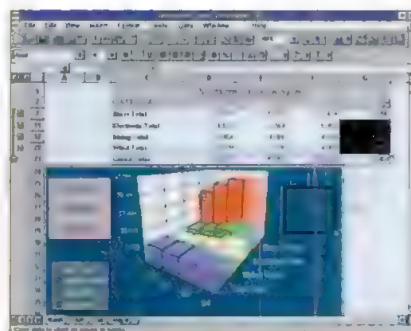


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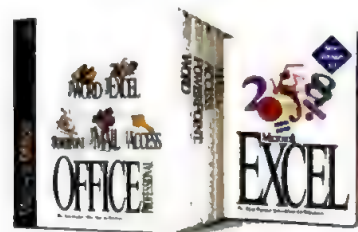
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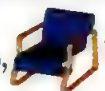
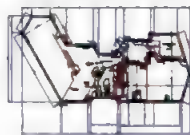
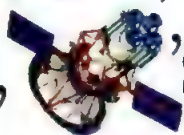
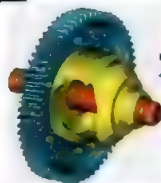
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CIRCLE 358 ON READER SERVICE CARD

Power Programming

BY JAMES RALPH

Prying Secrets from CMOS Memory

To most of us, the CMOS configuration screen is no stranger. We enter all sorts of useful system information into this screen, but we can't seem to get this information from CMOS later. CMOS also contains a wonderful clock with a built-in alarm, which we don't get to use. Furthermore, it contains boot diagnostic results that we aren't allowed to see. Well CMOS has kept its secrets long enough!

CMOS stands for *complementary metal-oxide semiconductor*—a type of transistor logic used as memory. Unlike the standard dynamic RAM (DRAM) used for main memory in PC-compatible systems, CMOS RAM is *static*. Figure 1 illustrates the difference between these two types of memory. DRAM, which is generally composed of two NMOS (negative metal-oxide semiconductor) transistors and one capacitor for each bit of data, will lose its memory after a short time. To

avoid this, the PC continually reads and rewrites your system's memory, doing what's called a *memory refresh*. CMOS RAM is a combination of two NMOS transistors and two PMOS (positive metal-oxide semiconductor) transistors connected in such a way that no capacitor is needed. CMOS will hold onto its memory indefinitely as long as it's connected to a small power source (usually a battery). CMOS memory takes up a lot of silicon real estate, however, and is much more expensive than DRAM, so it's used only where absolutely

needed. CMOS memory is used on IBM-compatible machines to store system information that needs to be preserved even when the computer is turned off. This information can be very useful for setup programs that need to know about system resources, such as installed memory or types of floppy disk drives. The CMOS is also where the system's real-time clock (RTC) stores its time and alarm information. A couple of bytes have even been set aside to hold boot-up diagnostic information. All of this information is available if you know where it is and how to get it.

ACCESSING CMOS MEMORY CMOS memory is accessed by manipulating two I/O ports. The first—port 70h—is a byte port used to set the address into CMOS memory. Port 70h is *write only*, so you can't use it to read the current address in

the CMOS memory. The second—port 71h—is used to read and write to the addressed data byte.

If not handled correctly, memory access using ports 70h and 71h can create some messy problems. For instance, let's say that we just set the address port to read byte 10h, but before we could read the information from the data port, a system interrupt occurred. The resulting interrupt service routine may need to read a byte of CMOS, changing the addressing port (port 70h) to point to, say, byte 7Ch. When our code gets control back, there is no way to tell that the address port has been altered, and we will read in the wrong byte of data. This can be disastrous and very difficult to detect.

Another use for port 70h is to enable and disable the nonmaskable interrupt (NMI). You disable the NMI by turning on the upper bit of the address value passed to port 70h. This feature limits the number of addressable CMOS bytes to 128, but many systems have only 64 bytes of CMOS anyway. Remember, port 70h is write only, so you can't use it to check the state of the NMI bit.

The assembly subroutines shown in Figure 2 demonstrate how to read and write to the CMOS RAM reliably. (These routines and all of the other routines and programs mentioned in this article can be downloaded from the Utilities/Tips Forum of PC MagNet in the file CMOSPC.ZIP.)

First, we must save the current state of the

machine so that we can restore it after we have completed accessing the CMOS. In this case, all we need to do is save the flag register by pushing it onto the stack.

Since the PC system is interrupt based, control can be taken away from our code at any time unless we take preventative steps. We must disable the system's ability to interrupt our code between the time we address the byte of CMOS we want and the time we actually perform the read or write.

Next, we set the CMOS memory-byte

Dynamic RAM Vs. Static RAM



Figure 1: Setting a cell of DRAM to hold a 1 is like putting a ball on the ramp in the picture on the left. The ball immediately starts to roll to the 0 position. The computer must catch the ball before it reaches 0 and put it back at the top of the ramp—a memory refresh. Put a ball in the discrete 1 bin of a cell of CMOS memory (the diagram on the right) and it will stay there indefinitely or until the computer changes it.

CMOS is used in PCs to store information such as the amount of installed memory, disk types, boot-up diagnostics, and the real-time clock data. Here's how to access it.



```
CMOS_ADDRESS equ 70h
CMOS_DATA equ 71h
DISABLE_NMI equ 80h
RTC_STATUS_D equ 8Dh
```

```

;-----
; ReadCMOSByte
; This routine will read a byte from the CMOS and return it to the
; caller.
; Call With : AL = CMOS Byte Address
; Alters : AL
; Returns : AL = Data byte
; Calls : Nothing
;-----
ReadCMOSByte: pushf ; Save current flags
               or al, DISABLE_NMI ; Make sure to turn off NMI
               cli ; Disable system interrupts
               out CMOS_ADDRESS, al ; Send address and disable
               ; NMI
               jmp $+2 ; I/O delay
               jmp $+2
               in al, CMOS_DATA ; Get the byte of data
               jmp $+2 ; I/O delay
               jmp $+2
               push ax ; Save byte of data
               mov al, RTC_STATUS_D ; Get unimportant address
               out CMOS_ADDRESS, al ; Select that address
               jmp $+2 ; I/O delay
               jmp $+2
               pop ax ; Restore saved byte
;-----
               push cs ; Flags are already on stack
               call Handle286Bug ; push CS to imitate INT
               ret ; Return with flags restored
;-----
Handle286Bug: iret ; Pop flags from stack
;-----

```

```

;-----
; WriteCMOSByte
; This routine will write a byte to the CMOS and return to the
; caller.
; Call With : AH = Value to write
;            AL = CMOS Byte to write to
; Alters : AH
; Returns : AL = Data byte
; Calls : Nothing
;-----
WriteCMOSByte: pushf ; Save current flags
               or al, DISABLE_NMI ; Make sure to disable NMI
               cli ; Disable system interrupts
               out CMOS_ADDRESS, al ; Send address and disable
               ; NMI
               jmp $+2 ; I/O delay
               jmp $+2
;-----
               xchg al, ah ; Move byte to write into
               ; AL
               out CMOS_DATA, al ; Write the byte of data
;-----
               jmp $+2 ; I/O delay
               jmp $+2
;-----
               mov al, RTC_STATUS_D ; Get unimportant address
               out CMOS_ADDRESS, al ; Select that address
               jmp $+2 ; I/O delay
               jmp $+2
;-----
               push cs ; Restore machine state and
               call Handle286Bug ; leave
               ret
;-----

```

Figure 2: These assembly routines demonstrate how to read from and write to the CMOS memory. To do so reliably requires that all system interrupts be disabled so that the CMOS address port won't be changed by an interrupt service routine.

address and disable the NMI. The NMI, as with any system interrupt, can also rip control away from our code and does not get disabled when we disable the other system interrupts. The NMI is generally not a problem, however, since it is almost strictly used for hardware failures (such as RAM parity errors and coprocessor and adapter board failures), but it happens to be convenient to disable.

We now either read or write to the addressed CMOS memory byte through the data port (port 71h). After performing the read or write, we need to set the address register to point to an unimportant CMOS data byte (preventing an accidental write to the data port) and reenabling NMI. Since we are unable to determine what the NMI status was before we were called, we must assume that it should be enabled. Finally, we need to restore the original state of the machine.

Because of a bug in some of the 80286 processors, the POPF (pop flags) instruction will actually enable interrupts for a short time. If interrupts were disabled when we entered the subroutine, it is critical that we do not allow interrupts to be enabled at all. We can avoid this bug by jumping through some hoops. The functions in Figure 2 imitate an INT instruction, forcing the IRET instruction to replace the flags for us without accidentally

enabling the system interrupts (Figure 2). The short program SHOWCMOS.COM, available in the Programming Forum of PC MagNet, demonstrates these functions.

Originally, AT systems had only 64 bytes of CMOS memory and only about half of these bytes were used. Now systems generally have 128 bytes of CMOS available, and the system BIOS (Basic Input/Output System) uses most of these bytes to store information on special or extended features. Determining how many bytes of CMOS data are present on a system requires two tests.

The first test checks that all of the CMOS memory-address lines are available. In systems that have only 64 bytes of CMOS, memory-address line 6 is generally unconnected. For example, if I were to request CMOS memory byte 101000b (50h) and memory-address line 6 were not active, I would lose the most significant bit of the address sent, so I would get the value for CMOS memory byte 001000b (10h) instead. This can be detected by comparing the lower 64 bytes (skipping the RTC values, because they are constantly changing) with the upper 64 bytes of CMOS memory. If they are all the same, address line 6 is probably not active.

The second test makes sure that

CMOS memory is actually installed for the upper 64 bytes of addresses. This is quickly tested for by reading a value from the upper 64 bytes and writing a new value in its place. If the new value isn't in that byte location when you try to read it again, CMOS memory is not present there.

The CMOS memory's primary function is to hold system-configuration data. During normal operation of the PC, the system BIOS needs to have the system's configuration available for setting up certain data structures. For instance, the CMOS retains the number and type of floppy disk drives to set the floppy disk controller correctly when performing floppy disk I/O. Only some of these bytes have been standardized; many of them change from BIOS to BIOS and even between BIOS revisions! Figure 3 contains the standard CMOS byte definitions and the descriptions for some vendor-unique bytes. Here are some tips on special handling for selected bytes:

Bytes 00h through 09h: RTC Data. The only thing to be careful of with these bytes is that they are all in binary-coded decimal. That is, the high nibble contains the tens digit and the low nibble contains the ones digit. For example, if the day of the month was the 29th, the day CMOS byte would contain the value 29h.

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CIRCLE 354 ON READER SERVICE CARD

Real-Time Clock Data Byte	Description
00h	Current second
01h	Alarm second
02h	Current minute
03h	Alarm minute
04h	Current hour
05h	Alarm hour
06h	Current day of week
07h	Current day of month
08h	Current month of year
09h	Current year
0Ah	Status register A Bit 7 = 1—updating time Bit 6—4—system clock divider Bit 0—3—periodic-interrupt rate
0Bh	Status register B Bit 7 = 1—abort current update cycle Bit 6—enable periodic interrupt Bit 5—enable alarm interrupt Bit 4—enable update-ended interrupt Bit 3—enable square-wave generator Bit 2 = 1—calendar in binary format 0—calender in BCD format Bit 1 = 1—24-hour clock 0—12-hour clock Bit 0 = 1 enable daylight saving time
0Ch	Status Register C Bit 7 = 1—interrupt active Bit 6 = 1—periodic-interrupt flag Bit 5 = 1—alarm flag Bit 4 = 1—update-end flag Bit 0—3—reserved
0Dh	Status byte D Bit 7 = 1—RTC has power Bit 0—6—reserved
0Eh	Diagnostic status Bit 7 = 1—RTC lost power Bit 6 = 1—CMOS checksum bad Bit 5 = 1—invalid system configuration Bit 4 = 1—invalid memory size Bit 3 = 1—fixed-disk adapter failure Bit 2 = 1—invalid CMOS time Bit 1—reserved Bit 0—reserved
0Fh	Shutdown status
System Configuration	
Data Byte	Description
10h	Floppy disk drive types Bits 7—4—drive 0 type Bits 3—0—drive 1 type 0000b—no drive 0001b—360K drive 0010b—1.2MB drive 0011b—720K drive 0100b—1.44MB drive 0101b—2.88MB drive
11h	Undocumented

System Configuration Data Byte	Description
12h	Hard disk types Bits 7-4—drive 0 type Bits 3-0—drive 1 type 0—no drive 1-E—types 1-14 F—use extended drive type
13h	Undocumented
14h	Equipment byte Bits 7-6—number of floppy disk drives 00b—1 floppy disk drive 01b—2 floppy disk drives Bits 5-4—display type 00b—not defined 01b—color, 40-column mode 10b—color, 80-column mode 11b—monochrome, 80-column mode Bits 3-2—undocumented Bit 1—coprocessor present if ON Bit 0—floppy disk drives installed if OFF
15h	Base memory (in kilobytes), low byte
16h	Base memory (in kilobytes), high byte
17h	Expanded memory (in kilobytes), low byte
18h	Expanded memory (in kilobytes), high byte
19h	Hard disk 0 extended drive type
1Ah	Hard disk 1 extended drive type
1Bh-2Dh	Undocumented
1Bh	AMI hard disk 0, type 47—low cylinder byte
1Ch	AMI hard disk 0, type 47—high cylinder byte
1Dh	AMI hard disk 0, type 47—head count
1Eh	AMI hard disk 0, type 47—write precomp cylinder, low byte
1Fh	AMI hard disk 0, type 47—write precomp cylinder, high byte
20h	AMI hard disk 0, type 47—hard disk control byte
21h	AMI hard disk 0, type 47—landing-zone low byte
22h	AMI hard disk 0, type 47—landing-zone high byte
23h	AMI hard disk 0, type 47—sectors per track
24h	AMI hard disk 1, type 47—low cylinder byte
25h	AMI hard disk 1, type 47—high cylinder byte
26h	AMI hard disk 1, type 47—head count
27h	AMI hard disk 1, type 47—write precomp cylinder, low byte
28h	AMI hard disk 1, type 47—write precomp cylinder, high byte
29h	AMI hard disk 1, type 47—hard disk control byte
2Ah	AMI hard disk 1, type 47—landing-zone low byte

System Configuration Data Byte	Description
2Bh	AMI hard disk 1, type 47—landing-zone high byte
2Ch	AMI hard disk 1, type 47—sectors per track
2Eh	Checksum high byte
2Fh	Checksum low byte
30h	Expanded memory, low byte
31h	Expanded memory, high byte
32h	Century in BCD
33h	Information flag
34h–3Fh	Undocumented
40h–7Fh	Undocumented (not available on all machines)
4Ah	AST laptop BIOS—backlight time-out 0–19 minutes
4Bh	AST laptop BIOS—hard disk time-out 0–19 minutes
4Ch–52h	AST BIOS—system password scan codes
60h	Phoenix BIOS hard disk, type 48—low cylinder byte
61h	Phoenix BIOS hard disk, type 48—high cylinder byte
62h	Phoenix BIOS hard disk, type 48—head count
63h	Phoenix BIOS hard disk, type 48—write precomp cylinder low byte
64h	Phoenix BIOS hard disk, type 48—write precomp cylinder high byte
65h	Phoenix BIOS hard disk, type 48—landing-zone low byte
66h	Phoenix BIOS hard disk, type 48—landing-zone high byte
67h	Phoenix BIOS hard disk, type 48—sectors per track
75h	Phoenix BIOS hard disk, type 49—low cylinder byte
76h	Phoenix BIOS hard disk, type 49—high cylinder byte
77h	Phoenix BIOS hard disk, type 49—head count
78h	Phoenix BIOS hard disk, type 49—write precomp cylinder, low byte
79h	Phoenix BIOS hard disk, type 49—write precomp cylinder, high byte
7Ah	Phoenix BIOS hard disk, type 49—landing-zone low byte
7Bh	Phoenix BIOS hard disk, type 49—landing-zone high byte
7Ch	Phoenix BIOS hard disk, type 49—sectors per track

Figure 3: This table contains the standard CMOS byte definitions and the descriptions for some vendor-unique bytes.

Byte 0Ah: Status Byte A. This byte controls the rates of the RTC. The system clock divider is a setting used by the RTC to select a crystal type. The PC uses a 32.768-kHz crystal set with the value of 010b. This value should not be altered: Any other setting will drastically slow the RTC. For example, if the value 011b is used, the RTC would take about 32 sec-

onds to increment the seconds byte. We'll discuss the periodic interrupt rate later. Note that the update-in-progress bit is *read only*.

Byte 0Bh: Status Byte B. This byte controls the features of the RTC. The daylight-saving-time feature winds up being useless, since the CMOS uses the last and not the first Sunday in April to

switch times. Also, the square-wave generator is not connected in most PCs, so enabling that feature won't accomplish anything.

Byte 0Ch: Status Byte C. This byte contains a block of flags that are set for any currently active RTC interrupts. This is used by the INT 70h handler to determine which interrupt or interrupts trig-


```

RTC_STATUS_A      equ      8Ah
UPDATING_RTC      equ      80h
RTC_SECONDS       equ      80h
RTC_MINUTES       equ      82h
RTC_HOURS         equ      84h

```

ReadRTC

This routine is responsible for reading the seconds, minutes, and hours from the RTC.

Call With : DS pointing to data

Alters : AX, DI

Returns : Hours:Minutes:Seconds in data region

Calls : ReadCMOSByte

```

ReadRTC:  push  ds          ; Save current data seg
          push  cs          ; Then make it point to
          pop   ds          ; the current code segment
          mov  di, OFFSET CurrentSeconds ; Point destination pointer
          ; to data area

          cli              ; Turn off system interrupts

WaitForUpdateStart:
          mov  al, RTC_STATUS_A * 2 ; Continuously read status
          Call ReadCMOSByte ; byte A until the RTC
          test al, UPDATING_RTC ; update cycle begins
          jnz  WaitForUpdateStart

```



```

WaitForUpdateFinish:
          mov  al, RTC_STATUS_A * 2 ; Then read status byte A
          Call ReadCMOSByte ; until the RTC update
          test al, UPDATING_RTC ; cycle finishes
          jnz  WaitForUpdateFinish

          mov  al, RTC_SECONDS * 2 ; Read in current RTC
          Call ReadCMOSByte ; seconds and store it
          stosb ; to a local variable

          mov  al, RTC_MINUTES * 2 ; Read in current RTC
          Call ReadCMOSByte ; minutes and store it to
          stosb ; a local variable

          mov  al, RTC_HOURS * 2 ; Read in current RTC
          Call ReadCMOSByte ; hours and store it to
          stosb ; a local variable

          sti      ds      ; Restore system interrupts
          pop  ds      ; Restore data segment
          ret          ; Return to caller

;----- Local Variables -----
CurrentSeconds db 00 ; Seconds in BCD
CurrentMinutes db 00 ; Minutes in BCD
CurrentHours   db 00 ; Hours in BCD

```

Figure 4: This subroutine shows how to read the current time just after the real-time clock has been updated.

gered the system interrupt. We'll look at this in greater detail later.

Bytes 0Eh and 0Fh: Diagnostic and Shutdown Status. These bytes retain error information obtained at boot-up. You may want to read these after a boot sequence to see whether there were any hardware failures.

Byte 12h: Hard Disk Type. The high nibble of this byte contains the type of the first hard disk if it's type 1 to 14, and the low nibble contains the type of the second hard disk if it's type 1 to 14. If the hard disk is not present, the corresponding nibble contains a 0. If it's an extended hard disk type, the corresponding nibble contains 0Fh, and the actual type is found in register 19h (first hard disk) or 1Ah (second hard disk).

Bytes 2Eh through 2Fh: CMOS Checksum. This value is usually generated by adding all the bytes from 10h through 2Dh, although this is not always the case. Some BIOS vendors use other algorithms. If you are going to change any of the configuration bytes, either change them back after you're done or determine how the checksum works before you change this value. If you don't, the next time you boot the system, you'll get a CMOS checksum error message.

THE REAL-TIME CLOCK The CMOS RTC data requires even more care to read. Because the RTC updates the current time once every second, there is a short period of time in which the data is not stable. During this interval, reads from the time, date, and alarm data bytes will have erratic results.

Fortunately, the RTC uses bit 7 of status byte A to indicate when the clock data is being updated. To produce the most stable results, we need to read the clock just after this bit is turned off. Figure 4 demonstrates a read of the current time with this problem in mind. This routine watches the update bit until it turns on and then off again. Just checking to see whether this bit is turned off is not good enough. We might end up checking the bit just before an update starts, in which case the update will occur while we're reading the clock. Immediately after the update-in-progress bit turns off, we read the data we need. This process is demonstrated by the program CLOCK1.COM, which you can download from PC MagNet.

The CMOS RTC has the ability to generate a system interrupt in the event of an alarm, at the end of each update cycle, and at periodic intervals. When any of these events occur, the RTC generates a system interrupt (IRQ 8) that invokes the routine pointed to by INT 70h—the RTC interrupt handler. Any combination of these events can be turned on or off at any time. Status byte B contains all of the enable bits for the RTC functions. Using these functions can be handy for timing purposes but handling INT 70h can get tricky, because the BIOS uses this interrupt's periodic intervals for wait functions. Wait functions are used for BIOS operations like floppy disk access, which takes more time than the processor requires.

THE ALARM CLOCK The RTC has a built-in alarm feature that will generate a system interrupt when the current time

matches the alarm time. You could use this feature in any program for which you need something to happen at a specific time of the day (for example, a reminder TSR that pops up with a message). Although the RTC keeps the date as well as keeping the time, the alarm can be set only for an hour-minute-second value. These values are stored directly into CMOS and are checked after each update. The BIOS provides the following functions for controlling the RTC alarm through INT 1Ah:

- Function 6: Set RTC alarm
- Function 7: Disable RTC alarm
- Function 9: Read RTC alarm

Function 6 will enable the RTC alarm interrupt as well as let the user set the alarm time. Function 7 will disable the RTC alarm interrupt, and function 9 will return the current RTC alarm settings. The RTC system-interrupt handler is designed so that INT 4Ah is called to handle any RTC alarms. The BIOS provides functions for setting the RTC alarm, but it's the programmer's responsibility to insert the alarm-handling code vector into the interrupt vector table for INT 4Ah. If you want to set the alarm yourself, you will need to watch INT 1Ah functions 6 and 7 and handle them appropriately. Figure 5 shows how to set and enable the RTC alarm with INT 1Ah.

The RTC can also be set to issue a system interrupt after every RTC update (once a second). This feature is handy when you need a program to display a clock in the background; it's preferable to using the system timer tick interrupt (INT

1Ch), because the RTC generates an interrupt evenly once a second rather than 18.2 times per second. Although the RTC-update method isn't as reliable as polling status byte A to determine when the update just ended, it's good enough for noncritical time readings.

The system BIOS's RTC interrupt

handler (INT 70h) was not written to handle the update interrupt. To use this interrupt, you need to replace the RTC interrupt handler completely, as shown in Figure 5. In this example, a subroutine is called to perform whatever function is desired in the event of an RTC-update end. Realize, however, that this interrupt oc-

curs once a second, so don't put too much code into that subroutine.

THE PERIODIC INTERRUPT The RTC can also generate a system interrupt at a specified interval. This is called the *periodic interrupt*. The RTC is set by default to generate 1,024 interrupts per second. The rate can be altered by changing the

```

ALARM_FUNCTION      equ      4Ah
BIOS_RAM_SEG        equ      40h
BIOS_WAIT_FLAG      equ      0A0h
WAIT_TIME_LOW       equ      9Ch
WAIT_TIME_HIGH      equ      9Eh

DOS_FUNCTION        equ      21h
DOS_SET_VECTOR      equ      25h
DOS_GET_VECTOR      equ      35h

PIC_ONE             equ      20h
PIC_TWO             equ      0A0h
PIC_TWO_MASK        equ      0A1h
END_OF_INT          equ      20h
TURN_ON_RTC         equ      0FEh
TURN_OFF_RTC        equ      01h

PERIODIC_INT_ACTIVE equ      40h
PERIODIC_INT_OFF    equ      0BFh
UPDATE_INT_ACTIVE   equ      10h
ALARM_INT_ACTIVE     equ      20h

REAL_TIME_CLOCK_INT equ      70h

RTC_STATUS_B        equ      0Bh
RTC_STATUS_C        equ      0Ch

;-----
; InstallRTCInterruptHandler
; This routine will install our intercept INT 70h (used by the Real
; Time Clock Interrupts) and replace it with our code.
; Call With      : Nothing
; Alters         : Nothing
; Returns        : Nothing
; Calls          : Nothing
;-----
InstallRTCInterruptHandler:
    push    ax                ; Save calling registers
    push    bx
    push    dx
    push    es

    mov     ax, (DOS_GET_VECTOR * 256) + REAL_TIME_CLOCK_INT
    int     DOS_FUNCTION      ; Get and save the INT 70h
    mov     WORD PTR OriginalRTCVector, bx ; vector for later
    mov     WORD PTR OriginalRTCVector + 2, es ; use
    mov     dx, OFFSET RTCInterruptHandler ; Replace the RTC
    int     dx                ; int with our counter
    mov     ax, (DOS_SET_VECTOR * 256) + REAL_TIME_CLOCK_INT
    int     DOS_FUNCTION

    in      al, PIC_TWO_MASK   ; Get the current enabled
    jmp     $+2                ; system interrupt from
    jmp     $+2                ; the second programmable
    and     al, TURN_ON_RTC    ; Turn on IRQ 8, the RTC
    out     PIC_TWO_MASK, al   ; system interrupt
    jmp     $+2                ; Send the value back to
    jmp     $+2                ; the programmable
    jmp     $+2                ; interrupt controller

    pop     es                ; Restore calling registers
    pop     dx
    pop     bx
    pop     ax
    ret

;-----
; RemoveRTCInterruptHandler
; This routine will restore the original INT 70h handler.
; Call With      : Nothing
; Alters         : Nothing
; Returns        : Nothing
; Calls          : Nothing
;-----
RemoveRTCInterruptHandler:
    push    ds                ; Save calling registers
    push    dx
    push    ax

    mov     dx, WORD PTR OriginalRTCVector ; Get original RTC
    mov     ds, WORD PTR OriginalRTCVector + 2 ; vector and
    mov     ax, (DOS_SET_VECTOR * 256) + REAL_TIME_CLOCK_INT
    int     DOS_FUNCTION      ; replace it

```

```

;-----
; Restore calling registers
;-----
pop     ax
pop     dx
pop     ds
ret

;-----
; RealTimeClockINTHandler
; This routine handles the IRQ generated by the RTC 1024 times per
; second. It will simply add one to our counters and pass control
; onto the original vector.
; Call With      : THIS ROUTINE IS NOT CALLED
; Alters         : Nothing
; Returns        : Nothing
; Calls          : Nothing
;-----
RTCInterruptHandler:
    push    ds                ; Save the calling
    push    ax                ; registers

;-----
GetActiveINTs: mov     ax, RTC_STATUS_B * 256 + RTC_STATUS_C
    call    ReadCMOSByte      ; Get status registers
    xchg    al, ah            ; B and C. AND them
    call    ReadCMOSByte      ; together to get ints that
    and     al, ah            ; are both active and
    and     al, 01100000b     ; enabled. Also AND off any
    or      al, al            ; unused bits.
    jz      AllINTsHandled

;-----
    test    al, PERIODIC_INT_ACTIVE
    jz      NoPeriodicInt

;----- Handle The Periodic Interrupt -----
    call    HandlePeriodicInt
    test    BYTE PTR DS:[BIOS_WAIT_FLAG], ON

    jz      NoPeriodicInt

;----- BIOS Wait Active -----
    push    ax
    mov     ax, BIOS_RAM_SEG
    mov     ds, ax
    sub     WORD PTR DS:[WAIT_TIME_LOW], 0976
    sbb     WORD PTR DS:[WAIT_TIME_HIGH], 0
    jnc     FinishedBIOSWait

;----- BIOS Wait Finished, Maybe Turn Off Periodic Int -----
    mov     BYTE PTR DS:[BIOS_WAIT_FLAG], OFF
    test    Int70hFlags, PERIODIC_INT_ACTIVE
    jnz     FinishedBIOSWait

;----- Disable Periodic Interrupts -----
    mov     al, RTC_STATUS_B
    call    ReadCMOSByte
    and     al, PERIODIC_INT_OFF
    xchg    ah, al
    mov     al, RTC_STATUS_B
    call    WriteCMOSByte

;-----
FinishedBIOSWait:
    pop     ax

;-----
NoPeriodicInt: test    al, UPDATE_INT_ACTIVE
    jz      NoUpdateInt

;-----
    call    HandleUpdateInt

;-----
NoUpdateInt: test    al, ALARM_INT_ACTIVE
    jz      NoAlarmInt

;-----
    sti     ALARM_FUNCTION

;-----
NoAlarmInt: jmp     GetActiveINTs

;-----
AllINTsHandled: mov     al, END_OF_INT      ; Send the end of interrupt
    out     PIC_TWO, al                    ; signal to the two PICs
    out     PIC_ONE, al
    pop     ax                            ; Restore our saved values
    pop     ds
    iret

;-----
HandlePeriodicInt:
    ret

;-----
HandleUpdateInt:
    ret

```

Figure 5: These three routines show how to set and enable the RTC alarm, completely replacing the BIOS's RTC interrupt handler in the process.

value in the lower 4 bits of status byte A. The table in Figure 6 shows the rate in which interrupts are generated for each of the settings. This is useful for precisely timing tasks such as calibration routines.

Be careful, though: The BIOS uses this interrupt within very important code (such as the floppy disk routines) to time delays and assumes that the interrupt rate will be at the default, so be sure to reset the rate after your code is finished. The RTC interrupt-handler code runs 1,024 times every second at the default setting! That can generate a tremendous amount of overhead. If this interrupt is accidentally left on, it can really bog down a system.

Replacing the RTC interrupt handler is difficult, but it's necessary if you want to handle any of the RTC interrupts yourself. Unfortunately, status byte C, which designates currently active interrupts, is reset each time it is read. This means that the status of the RTC just after the system interrupt occurs is lost after the first reading of that status byte. Therefore, the routine that reads this byte must also handle all of its consequences. The system BIOS depends on its own internal RTC interrupt handler to manage the enabling and disabling of the RTC features.

For instance, the periodic interrupt is enabled by calling certain functions but is disabled in the RTC interrupt handler. If we are to keep the system alive, we must handle these responsibilities in the replacement code. Fortunately, the BIOS handles only RTC alarm and periodic interrupts in its internal code, so the update interrupt requires no special code. Also, the RTC alarm is handled well by the BIOS, so we can handle an alarm by simply mimicking a BIOS.

The example RTC-interrupt-handler installation and removal code shown in Figure 5 is the basic package required to replace the BIOS's handling of the RTC system interrupts. Notice in the RTC-interrupt installation routine that we specifically enable IRQ 8 to allow the RTC to

Periodic-Interrupt Rate Settings			
Lower Nibble	Interrupts per Second	Lower Nibble	Interrupts per Second
0000b	None	1000b	256
0001b	Not defined	1001b	128
0010b	Not defined	1010b	64
0011b	8,192	1011b	32
0100b	4,096	1100b	16
0101b	2,048	1101b	8
0110b	1,024 (default)	1110b	4
0111b	512	1111b	2

Figure 6: The rate of the periodic interrupt can be altered by changing the value in the lower 4 bits of status byte A. Here are the values for those bits and the rates they will yield.

interrupt the system. The first step of our RTC interrupt handler is to read status byte C. This byte tells us which kind of RTC interrupts are in progress, since there can be more than one. The next step is to read status byte B, which indicates the currently enabled RTC interrupts. We

use this to strip off any unwanted bits from the interrupts-in-progress byte. The result is used to determine which interrupts to handle.

Next, we break the routine into three sections, one for each type of interrupt. The periodic interrupt is handled first. The code in Figure 5 sets a flag when this portion of the interrupt handler should run. If the

flag is on, the interrupt handler will do whatever you programmed into the HandlePeriodicInt routine. Remember that this occurs 1,024 times per second at the default setting, so don't do anything too demanding. I would recommend restricting work to incrementing a counter or some other similarly quick activity.

The next thing we do is determine whether to handle the BIOS's wait-function code for the periodic interrupt. Fortunately, the BIOS sets a flag when using its wait function, because it cannot handle more than one wait function at a time. We can simply check this flag before running the code. We then subtract 976 microseconds from the wait time stored in low memory as the BIOS code does. If we find

that the wait time has run out, we check to see if we can turn off the periodic interrupt. If the flag is on, we leave the periodic interrupt enabled; otherwise, we must disable the interrupt. Be aware that to disable the periodic interrupt, we must check to make sure that the BIOS is not currently using it before we go ahead and disable it.

The next step simply checks for the update interrupt and if it was triggered, handles it. Notice that the RTC alarm code enables system interrupts before calling the code at INT 4Ah. This allows other areas of the system to be serviced. Because this interrupt can be used by any programmer, the code will not necessarily be compact. At the end of the routine, we issue an end-of-interrupt message to the two interrupt controller chips and return back to the process that was interrupted. (The code in Figure 5 is demonstrated by CLOCK2.COM, available on PC MagNet.)

BE A CMOS SLEUTH Reading and writing the CMOS data is straightforward, but often the data you get back is not. Half the fun of being able to access the CMOS is determining what it's all used for. This is by no means an easy chore, but by spending some time sleuthing, you should be able to account for every byte of CMOS data. If you're not one for guesswork and want a head start on undocumented CMOS bytes, I highly recommend the book *The Undocumented PC*, by Frank Van Gilluwe (Addison-Wesley, 1994). □

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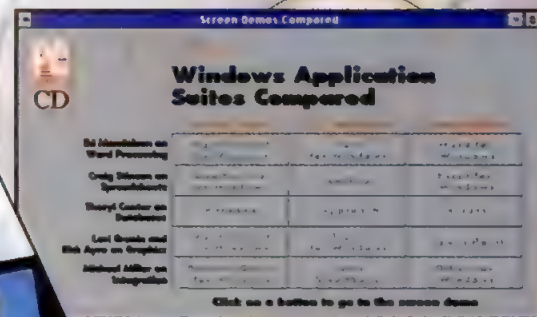
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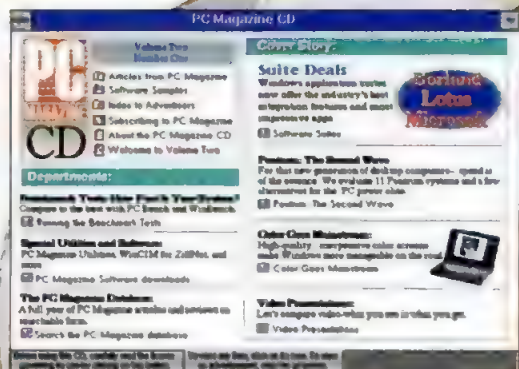
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Utilities

BY JEFF PROSISE

Turn Wallpaper Into AllPaper

Microsoft Windows is quite adept at handling graphics images, but surprisingly this operating system won't stretch undersized images to fill the screen. Log on to CompuServe or a similar on-line service and you'll find Windows wallpaper files galore. Download them and try to use them, though, and you'll probably find that many do not fit. The image size isn't required to match the screen size, but a wallpaper image is much more attractive when it does.

What's needed is a tool for sizing wallpaper images to fit. AllPaper reads wallpaper (.BMP) files and stretches them to fit your screen—no matter what the screen and image dimensions. AllPaper will, for example, take a 640-by-480 .BMP file and create a 1,024-by-768 version of it. Or AllPaper will compress an 800-by-600 wallpaper file so that you can see the entire image on a 640-by-480 VGA screen.

AllPaper and its source code are available free of charge. You can download them from PC MagNet's Utilities/Tips Forum (archived as ALLPAP.ZIP) or obtain them by mail. For details, refer to the sidebar "Guide to Our Utilities & How to Get Them." AllPaper was written in C and can be compiled with Microsoft C/C++ 7.1.

USING ALLPAPER Windows wallpaper is nothing more than a bitmapped image stored as a native Windows .BMP file. Look in your Windows directory (usually C:\WINDOWS) and you'll see that it contains several .BMP files. Some are placed there when Windows is installed. You may have copied others there after Windows was installed. When you start the

Control Panel and double-click the Desktop icon, you'll see the names of all the .BMP files in the Windows directory listed in the File combo box. Selecting a filename and clicking OK installs the specified file as the current wallpaper file. Any .BMP file in the Windows directory can serve as wallpaper. You can create .BMP wallpaper files of your own using Windows Paintbrush or other paint programs that can save images in .BMP format.

AllPaper resizes an image by reading a .BMP file and creating a new .BMP file with the dimensions you specify. The original .BMP file is not altered unless you give the output file the same name as the input file. Once a new .BMP file is generated with AllPaper, you can install it with the Control Panel. To switch more quickly between wallpaper selections and other configuration options, you can use Douglas Boling's Switcher utility (for more information, see "Switch Windows Setups

with Switcher," May 31, 1994).

There are three steps to resizing a wallpaper image: First, click the Select Bitmap button to display the Open dialog box and either type in the wallpaper filename or select the filename from the list box. Click OK to finalize the selection. AllPaper will display a miniature version of the wallpaper image, as shown in Figure 1. The filename, the image width, and the image height appear above the image.

The second step is to choose an output resolution by selecting the appropriate radio button. If you're not sure what the dimensions of your screen are and want to stretch or shrink the wallpaper image to fit, select Screen Size. AllPaper will use the current screen dimensions to size the output image.

The third and last step is to click the Shrink/Expand button and enter an output filename. Click OK and the new image will be saved to disk.

Figures 2 through 4 illustrate the effect of using AllPaper to turn an undersized wallpaper file into a full-screen image. In Figure 2, the original 640-by-480-pixel image is shown centered on a 1,024-by-768 screen. Note the blank border surrounding the image. Figure 3 shows the same image at the same resolution, but this time the image is tiled. The blank borders are gone, but the screen appears asymmetrical. Figure 4 shows a 1,024-by-768 version of the image rendered by AllPaper. Now the image fills the desktop.

AllPaper will handle most .BMP files including OS/2-style .BMP files but will not work on the little-used 16-bit and 32-bit .BMP file formats supported by Microsoft Windows NT or on compressed .BMPs. The .BMP specification outlined in the Microsoft Windows Software Development Kit defines run-length-encoding methods that permit 4-bit-per-pixel and 8-bit-per-pixel .BMP files to be compressed. The Windows GDI (Graphics Device Interface) provides functions for dealing with compressed files, but for reasons you'll learn later, AllPaper doesn't use GDI functions when it manipulates images. Because compressed .BMP files are poorly documented and ill defined (Microsoft is discouraging their use), it's difficult to work with them outside of the GDI. Thus, AllPaper restricts itself to uncompressed .BMPs. If you attempt to load

Top 10 Utilities

Rank	Utility
1	FINDIR - Locates available IRQs
2	WTIME - Keeps PC clock accurate
3	MONTOR - Monitors system resources
4	INCTRL - Controls Windows' installation
5	BAT2EX - Compiles batch files
6	PRUNE - Manages DOS files
7	SWITC - Creates multiple Windows setups
8	BUGS - Windows 3.1 screen saver
9	THINDI - Streamlines hard disk
10	MBOOT - Multiple boot program
<i>This list is based on the total number of downloads each utility has had on PC MagNet over the past month. To download these files, type GO ZNT:TIPS. For more information, see the sidebar "Guide to Our Utilities & How to Get Them."</i>	

a compressed .BMP file, AllPaper displays the message, "Unsupported file format (DIB is compressed)." (DIB stands for *device-independent bitmap*, the data format that lies at the heart of every .BMP file.)

With AllPaper, you can scour bulletin boards for wallpaper without being concerned about the dimensions of the bitmapped images. Just grab an image that suits you and size it to fit. If you're a CompuServe member, you can access .BMP files from ZiffNet, from the CompuServe graphics forums (GO GRAPHICS), and elsewhere. Many of the files uploaded to CompuServe are stored in .GIF (Graphics Interchange File) format. If you find a .GIF (or other non-.BMP) bitmap file that you'd like to use for wallpaper, you will need to use an external

code surrounding one call to StretchBlt. First, I would read a .BMP file from disk and create a Windows bitmap from it. Then, I would select the bitmap into a memory device context (the *source* device context) and create a second device context (the *destination* device context) whose dimensions were equivalent to the dimensions of the output bitmap. Next, I would copy the bitmap from the source device context to the destination device context by calling StretchBlt. Finally, I would extract the resized bitmap from the destination device context and write it to the output file. Because Windows functions would be used throughout, all of this process would be handled in a device-independent manner and compressed .BMPs would be handled transparently.

It didn't turn out to be that simple. DIBs are device independent all right, but a DIB isn't a GDI object: It's a blueprint for a GDI bitmap object. To use handy GDI functions such as StretchBlt, you must convert a DIB into a bitmap, and when you do, you sacrifice the bitmapped image's device-independent qualities.

The problem is most apparent when you use a 256-color DIB to create a bitmap in a 16-color device context. Windows throws away 240 colors and creates a 16-color bitmap, which results in a dreadful-looking image. If you're lucky, the bitmapped image is only posterized, meaning similar colors become the same, and gradually shaded areas of the image become areas of flat color. If you're not so lucky, the image may undergo wholesale color shifts—with reds becoming greens and other colors changing to other unrelated hues.

I tried various workarounds but invariably ran into other obstacles. The only solution, it seemed, was to avoid creating



Figure 2: Centering a 640-by-480 wallpaper image on a 1,024-by-768 screen leaves an unappealing blank border around the edges.

bitmap objects and deal directly with the DIBs. Therefore, I decided to forego the StretchBlt function and write a function of my own that operates directly on the DIB bits input from a .BMP file. This required a little more work on my part, but it resulted in a utility that is truly device independent and works with any graphics hardware or video mode.

The bulk of the work in shrinking or expanding a bitmapped image is handled by three functions: CopyBits, StretchBits, and StretchScanLine. CopyBits works at the lowest level to copy the bit or bits representing an individual pixel from the source bitmap to the destination bitmap. CopyBits is called repeatedly by StretchScanLine, which shrinks or expands an entire scan line by reading from left to right and removing or replicating bits as required. StretchScanLine, in turn, is called by StretchBits, which reads and

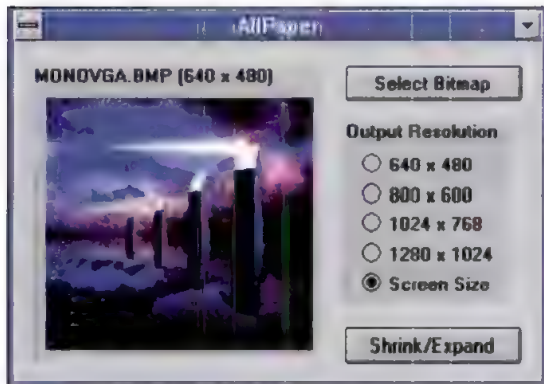


Figure 1: AllPaper displays a miniature version of the wallpaper image you select. The Output Resolution radio buttons let you specify an output size.

utility. There are several .GIF-to-.BMP file converters available—some free, some shareware—on CompuServe and other bulletin boards. Some, such as Kyle Powell's WinGIF (\$15), can read a run-length-encoded .BMP file and output a standard, uncompressed .BMP file.

INSIDE ALLPAPER On the surface, writing a Windows utility that stretches a wallpaper image to an arbitrary size doesn't seem all that hard. After all, Windows offers a handy StretchBlt function for *blitting* (block transferring) a rectangular region of pixels from one location to another. The two rectangles don't have to be the same size or shape; StretchBlt will shrink or expand the image as required if the source and destination rectangles differ.

When I originally set out to write AllPaper, I envisioned a few hundred lines of

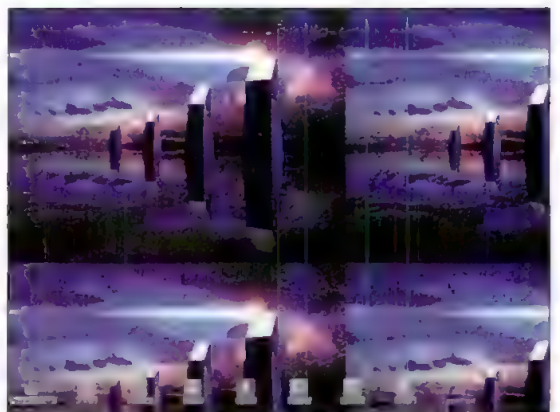
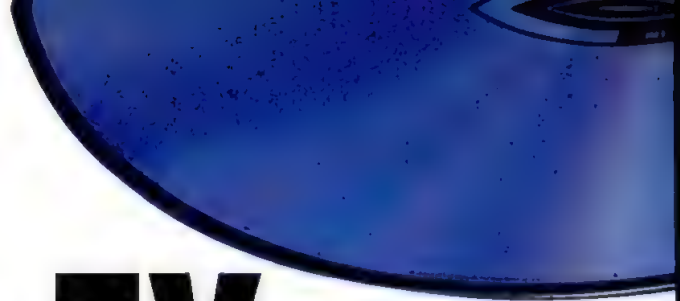
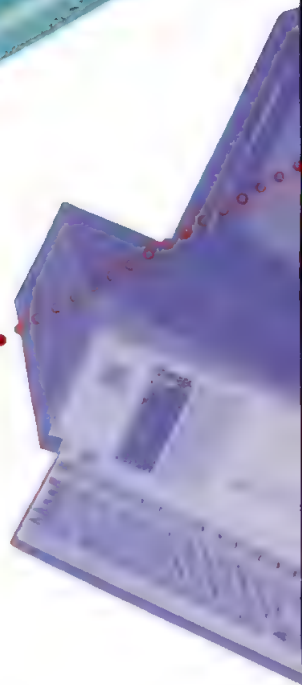
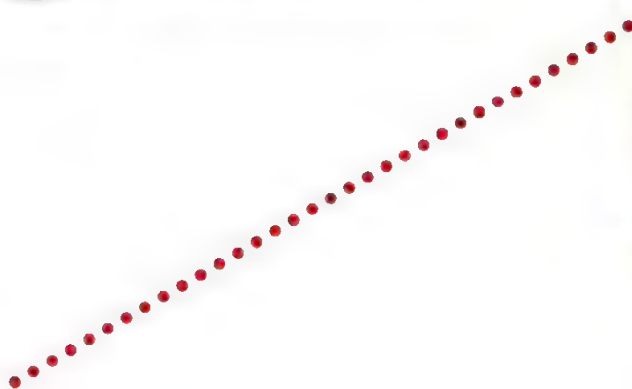


Figure 3: Tiling a 640-by-480 image on a 1,024-by-768 screen eliminates the blank border, but the multiple image may not be what you want.

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Figure 4: After the original 640-by-480 image is stretched to 1,024-by-768 with AllPaper, one copy of the image fills the desktop.

processes the source bitmap one scan line at a time. StretchBits removes or replicates scan lines to make the bitmap fit the destination height, while StretchScanLine does the same for line widths. Since the lower-level functions are called by the higher-level functions, an application needs to call only StretchBits to shrink or expand a bitmapped image to any arbitrary size.

In preparation for stretching a bitmap, AllPaper calls the local ReadDib func-

tion, which reads a .BMP file from disk. ReadDib returns three crucial pieces of information: a handle to a global memory block containing a bitmap information header and a color table, a handle to a global memory block containing the bitmapped bits, and a handle to a logical palette created from the file's color table. The information is returned in a DIB structure provided by the caller. (For information regarding the format of a .BMP file and its components, see the sidebar "The .BMP File Format.")

Afterward, AllPaper calls Windows' InvalidateRect function to invalidate the portion of the window that displays the bitmap, and the WM_PAINT message handler displays the bitmapped image using StretchBlt's cousin, StretchDIBits. StretchDIBits is similar to StretchBlt except that it doesn't require a bitmap handle; it displays a screen image directly from the bits belonging to a DIB. In other words, it allows a program to display a DIB without creating a bitmap object first.

Another of the message handler's interesting aspects is its use of the palette handle returned by ReadDib to select and realize a logical palette so that the bitmap will be displayed properly. The WM_QUERYNEWPALETTE and WM_PALETTECHANGED message handlers also play a role in manipulating the palette colors.

Space doesn't permit us to examine the painting and palette routines in detail, but if you're interested, you can check them out in ALLPAPER.C. The Microsoft Windows SDK and Microsoft Developer Network CD-ROM contain loads of information about bitmap and palette handling. We'll devote the rest of this article to examining StretchBits and its helper functions.

RESIZING A BITMAP AllPaper's StretchBits function is called by the StretchDibAndSave function, which is called by the IDD_SAVE portion of WndProc's WM_COMMAND message handler. StretchDibAndSave lays the groundwork for the call to StretchBits by building a bitmap information header and color table for the output DIB. The bitmap information header is copied from the original DIB. After this, the biWidth, biHeight,

```
/*
 * StretchBits shrinks or expands the bits in a buffer representing a
 * bitmap image.
 *
 * Input parameters:
 *
 *   hpbDest = Pointer to buffer for destination bitmap
 *   nWidthDest = Width of destination bitmap
 *   nHeightDest = Height of destination bitmap
 *   hpbSrc = Pointer to buffer for source bitmap
 *   nWidthSrc = Width of source bitmap
 *   nHeightSrc = Height of source bitmap
 *   nBits = Bits per pixel
 *
 * Returns:
 *
 *   Nothing
 */

void StretchBits (BYTE __huge *hpbDest, int nWidthDest, int nHeightDest,
                 BYTE __huge *hpbSrc, int nWidthSrc, int nHeightSrc,
                 int nBits)
{
    double dRatio;
    DWORD dwIncrement, dwIncrementWidth, dwIncCount;
    UINT nMultiplier, nMultiplierWidth, nOutputRows, i, j;
    UINT nBytesPerLineSrc, nBytesPerLineDest;

    //
    // Compute the replication factors for both width and height.
    //
    dRatio = (double) nWidthDest / (double) nWidthSrc;
    nMultiplierWidth = (UINT) floor (dRatio);
    dwIncrementWidth = (DWORD) ceil ((dRatio - floor (dRatio)) * COUNTER_BASE);

    dRatio = (double) nHeightDest / (double) nHeightSrc;
    nMultiplier = (UINT) floor (dRatio);
    dwIncrement = (DWORD) ceil ((dRatio - floor (dRatio)) * COUNTER_BASE);
}
```

```
//
// Compute the size (in bytes) of each scan line in both the source and
// destination bitmaps.
//
nBytesPerLineSrc = (UINT) LINEWIDTH ((DWORD) nWidthSrc * (DWORD) nBits);
nBytesPerLineDest = (UINT) LINEWIDTH ((DWORD) nWidthDest * (DWORD) nBits);

//
// Initialize counters.
//
dwIncCount = 0;
nOutputRows = 0;

//
// Shrink or expand the bits one scan line at a time.
//
for (i=0; i<nHeightSrc; i++) {
    if (nMultiplier != 0) {
        for (j=0; j<nMultiplier; j++) {
            StretchScanLine (hpbDest, nWidthDest, hpbSrc, nWidthSrc,
                             nBits, nMultiplierWidth, dwIncrementWidth);
            hpbDest += nBytesPerLineDest;
            nOutputRows++;
        }
        dwIncCount += dwIncrement;
    }
    if ((dwIncCount >= COUNTER_BASE) && (nOutputRows < nHeightDest)) {
        StretchScanLine (hpbDest, nWidthDest, hpbSrc, nWidthSrc, nBits,
                         nMultiplierWidth, dwIncrementWidth);
        hpbDest += nBytesPerLineDest;
        nOutputRows++;
        dwIncCount -= COUNTER_BASE;
    }
    hpbSrc += nBytesPerLineSrc;
}
```

Figure 5: The StretchBits function stretches an entire bitmap to a specified size.

and `biSizeImage` fields are modified to reflect the new image dimensions. The color table is copied over intact, because the bitmap's colors do not change. Next, using the newly computed `biSizeImage` value as the block size, `StretchDibAndSave` allocates a global memory block to hold the stretched bitmap bits:

```
if ((hBits =
GlobalAlloc (GMEM_MOVEABLE |
GMEM_ZEROINIT,
lpBmih->biSizeImage)) == NULL) {
```

```
GlobalUnlock (hBmi);
GlobalFree (hBmi);
return NOT_ENOUGH_MEMORY;
}
```

Then it obtains pointers to the global memory block containing the original bitmap and to the block that was just allocated:

```
hpbSrc =
(Byte __huge *) GlobalLock (pDib-
>hBits);
```

```
/*
 * StretchScanLine shrinks or expands the bits in a buffer representing one
 * scan line of a bitmap image.
 *
 * Input parameters:
 *
 * hpbDest = Pointer to buffer for destination bitmap
 * nWidthDest = Width of destination bitmap
 * hpbSrc = Pointer to buffer for source bitmap
 * nWidthSrc = Width of source bitmap
 * nBits = Bits per pixel
 * nMultiplier = Multiplicative pixel replication factor
 * dwIncrement = Incremental pixel replication factor
 *
 * Returns:
 *
 * Nothing
 */
```

```
void StretchScanLine (Byte __huge *hpbDest, int nWidthDest,
Byte __huge *hpbSrc, int nWidthSrc, int nBits,
UINT nMultiplier, DWORD dwIncrement)
{
    UINT nOutputPixels, i, j;
    DWORD dwIncCount, dwBitIndexSrc, dwBitIndexDest;

    //
    // Initialize counters.
    //
    dwIncCount = 0;
    nOutputPixels = 0;
    dwBitIndexSrc = 0;
    dwBitIndexDest = 0;

    //
    // Read through the scan line from left to right, writing pixels to the
    // destination buffer as appropriate.
    //
    for (i=0; i<nWidthSrc; i++) {
        if (nMultiplier != 0) {
            for (j=0; j<nMultiplier; j++) {
                CopyBits (hpbDest, dwBitIndexDest, hpbSrc, dwBitIndexSrc,
                    nBits);
                dwBitIndexDest += nBits;
                nOutputPixels++;
            }
        }
        dwIncCount += dwIncrement;

        if ((dwIncCount >= COUNTER_BASE) && (nOutputPixels < nWidthDest)) {
            CopyBits (hpbDest, dwBitIndexDest, hpbSrc, dwBitIndexSrc, nBits);
            dwBitIndexDest += nBits;
            nOutputPixels++;
            dwIncCount -= COUNTER_BASE;
        }
        dwBitIndexSrc += nBits;
    }
}
```

Figure 8: `StretchScanLine` is called by `StretchBits` to expand or compress one scan line in a bitmapped image.

```
hpbDest =
(Byte __huge *) GlobalLock (hBits);
hpbBuffer = hpbDest;
```

Finally, it calls `StretchBits` to stretch the bitmap:

```
StretchBits (hpbDest, (int) lWidth,
(int) lHeight, hpbSrc,
(int) lWidthSrc, (int) lHeightSrc,
(int) lpBmih->biBitCount);
```

`StretchBits`, which is listed in Figure 5, takes seven input parameters. The `hpbDest` parameter is a huge pointer to the buffer in which the destination bitmap will be created. The `nWidthDest` and `nHeightDest` parameters specify the width and height of the destination bitmap. The `hpbSrc` parameter is a huge pointer to the source bitmap, and `nWidthSrc` and `nHeightSrc` specify the dimensions of the source bitmap. The `nBits` parameter specifies the number of bits per pixel.

`StretchBits` performs the same operation on a buffer full of DIB bits that Windows' `StretchBlt` function performs on a bitmap object selected into a device context. It increases or decreases the number of scan lines and the widths of individual lines in the bitmap to the dimensions specified by the `nWidthDest` and `nHeightDest` parameters. Before `StretchBits` is called, the destination memory buffer holds nothing but 0s. When `StretchBits` returns, the buffer holds a resized version of the source bitmap.

The key to creating a `StretchBits` function is to devise an algorithm that enforces two rules. First, if the bitmap's height is being reduced, the algorithm should eliminate scan lines as required, and the eliminated scan lines should be spaced evenly throughout the image. If the height is increased, the algorithm should replicate scan lines to expand the bitmap height evenly.

The second rule is similar. If the bitmap's width is being reduced, the algorithm should eliminate columns of pixels as required, and the eliminated columns should be spaced evenly throughout the image. If the height is increased, the algorithm should replicate columns to expand the bitmap width evenly.

Suppose the bitmap is 640 by 768 and



the screen is 800 by 600. The bitmap's height is being reduced from 768 to 600 scan lines, and the width is being increased from 640 to 800 pixels. The algorithm must remove 168 evenly spaced scan lines from the bitmap while adding 160 evenly spaced columns. The algorithm should scan the bitmap vertically, copying scan lines from the source buffer to the destination buffer but skipping an occasional scan line so that only 600 scan lines are output. It should also scan each row of pixels from left to right, duplicating every pixel in the source buffer and occasionally outputting 2 pixels to increase the bitmap's width to 800. The challenge in implementing such an algorithm is knowing when to skip a scan line or column and when to duplicate it and doing this evenly to maintain likeness between the images.

AllPaper's StretchBits function implements these rules. First, it computes stretching ratios—floating-point values that drive the skipping and replication of pixels—for the width and height by dividing the destination width and height by the source width and height. Then from each of these floating-point values, StretchBits derives two integer quantities: a multiplier and an incremental value.

Continuing with our previous example, the width ratio is 800 divided by 640, or 1.25, and the height ratio is 600 divided by 768, or 0.78125. On the average, then, StretchBits needs to generate 1.25 columns in the destination bitmap for every column in the source bitmap and 0.78125 scan lines in the destination bitmap for every scan line in the source bitmap. The multiplier value (called *nMultiplier*) derived from each of these ratios is the integer portion of the ratios (1 for 1.25 and 0 for 0.78125), and the incremental value (called *dwIncrement*) is an integer that equals the fractional portion of the ratios multiplied by COUNTER_BASE, which is equal to 1 million (250,000 for 1.25 and 781,250 for 0.78125).

After setting *nBytesPerLineSrc* and *nBytesPerLineDest* to the number of bytes per line in the source and destination bitmaps (taking into account the fact that lines must end on 32-bit boundaries) and *dwIncCount* and *nOutputRows* to 0, StretchBits enters a for loop that scans the source bitmap line by line. For each line in the source bitmap, StretchBits outputs

nMultiplier lines to the destination bitmap. Then StretchBits adds the value of *dwIncCount* to a cumulative count stored in *dwIncCount*. If *dwIncCount* equals or exceeds COUNTER_BASE, an additional scan line is output to the destination buffer and COUNTER_BASE is subtracted from *dwIncCount*.

Finally, StretchBits updates the pointer

to the current location in the source bitmap (*hpbSrc*) so that it points to the beginning of the next scan line and loops back to begin processing that line.

Scan lines from the source bitmap are output to the destination bitmap with the StretchScanLine function. StretchScanLine does the same thing for the pixels in a line that StretchBits does for lines in the

```
/*
 * CopyBits copies the specified number of bits from the source bitmap to
 * the destination bitmap.
 *
 * Input parameters:
 *
 *   hpbDest = Pointer to buffer for destination bitmap
 *   nBitIndexDest = Destination bit index
 *   hpbSrc = Pointer to buffer for source bitmap
 *   nBitIndexSrc = Source bit index
 *   nBits = Number of bits to copy
 *
 * Returns:
 *
 *   Nothing
 *
 * Notes:
 *
 *   For 8- and 24-bit moves, it is valid to assume that the source and
 *   destination addresses for the move fall on byte boundaries. For 4-bit
 *   moves, it is valid to assume that the source and destination addresses
 *   fall on byte or half-byte boundaries. This function handles 1-, 4-, 8-,
 *   and 24-bit moves exclusively. No error checking is performed to ensure
 *   that the value passed in the nBits parameter is 1, 4, 8, or 24.
 */
void CopyBits (BYTE __huge *hpbDest, DWORD dwBitIndexDest, BYTE __huge *hpbSrc,
               DWORD dwBitIndexSrc, int nBits)
{
    DWORD dwByteIndexSrc, dwByteIndexDest;
    BYTE byAndMaskSrc, byAndMaskDest, byOrVal;

    dwByteIndexSrc = dwBitIndexSrc >> 3;
    dwByteIndexDest = dwBitIndexDest >> 3;

    switch (nBits) {

    case 1:
        byAndMaskSrc = 0x80 >> (dwBitIndexSrc & 0x07);
        byOrVal = 0x80 >> (dwBitIndexDest & 0x07);
        byAndMaskDest = byOrVal;
        hpbDest[dwByteIndexDest] &= byAndMaskDest;
        if (hpbSrc[dwByteIndexSrc] & byAndMaskSrc)
            hpbDest[dwByteIndexDest] |= byOrVal;
        break;

    case 4:
        byAndMaskDest = ((dwByteIndexDest << 3) == dwBitIndexDest) ?
            0x0F : 0xF0;
        byAndMaskSrc = ((dwByteIndexSrc << 3) == dwBitIndexSrc) ?
            0xF0 : 0x0F;
        byOrVal = hpbSrc[dwByteIndexSrc] & byAndMaskSrc;

        if ((byAndMaskSrc == 0xF0) && (byAndMaskDest == 0xF0))
            byOrVal >>= 4;
        else if ((byAndMaskSrc == 0x0F) && (byAndMaskDest == 0x0F))
            byOrVal <<= 4;

        hpbDest[dwByteIndexDest] = (hpbDest[dwByteIndexDest] &
            byAndMaskDest) | byOrVal;
        break;

    case 8:
        hpbDest[dwByteIndexDest] = hpbSrc[dwByteIndexSrc];
        break;

    case 24:
        hpbDest[dwByteIndexDest] = hpbSrc[dwByteIndexSrc];
        hpbDest[dwByteIndexDest + 1] = hpbSrc[dwByteIndexSrc + 1];
        hpbDest[dwByteIndexDest + 2] = hpbSrc[dwByteIndexSrc + 2];
        break;

    }
}
```



Figure 7: The CopyBits function is called by StretchScanLine to copy one or more bits of pixel data from the source bitmap to the destination bitmap.

The .BMP File Format

By Jeff Prosise

The .BMP file format that is used throughout Windows divides a graphics file into four major parts: a bitmap file header, a bitmap information header, a color table containing RGBQUAD or RGBTRIPLE structures, and the bitmap bits. We'll take a look at each of these in turn.

THE BITMAP FILE HEADER A .BMP file's bitmap file header is 14 bytes long and is formatted identically to the BITMAPFILEHEADER structure defined in WINDOWS.H:

```
typedef struct tagBITMAPFILEHEADER
{
    UINT bfType;
    DWORD bfSize;
    UINT bfReserved1;
    UINT bfReserved2;
    DWORD bfOffBits;
} BITMAPFILEHEADER;
```

The bfType field holds the signature value 0x4D42 (BM), which identifies the file as a .BMP file. The bfType field holds the file size. The bfReserved1 and bfReserved2 fields are not used. If you write a program that creates .BMP files, you should set these fields to 0 in case they are used in future versions of Windows. The bfOffBits field specifies the offset (relative to the beginning of the file) where the data representing the bitmap itself begins. The value of this field is normally 0x3E for monochrome (2-color) .BMP files, 0x76 for 16-color .BMP files, 0x436 for 256-color .BMP files, and 0x36 for true-color (16.7 million-color) .BMP files.

THE BITMAP INFORMATION HEADER The bitmap information header contains such important information about the bitmap image as its width and height. There are two possible formats for this header. The first—and the most common—is described by the BITMAPINFOHEADER structure defined in WINDOWS.H:

```
typedef struct tagBITMAPINFOHEADER
{
    DWORD biSize;
    LONG biWidth;
    LONG biHeight;
    WORD biPlanes;
    WORD biBitCount;
    DWORD biCompression;
    DWORD biSizeImage;
    LONG biXPelsPerMeter;
    LONG biYPelsPerMeter;
    DWORD biClrUsed;
    DWORD biClrImportant;
} BITMAPINFOHEADER;
```

The important fields are biSize, which holds the length of the header in bytes; biWidth and biHeight, which identify the width and height of the image; biBitCount, which identifies the number of bits per pixel in the image and thus the maximum number of colors that the bitmap can contain; biCompression, which identifies the compression scheme (if any) that the bitmap employs (0 if the bitmap is uncompressed); and biSizeImage, which identifies the size (in bytes) of the bits representing the bitmap image.

It is valid to set biSizeImage equal to 0 for uncompressed images, but this field should hold the actual image size for compressed images. Some programs that create compressed .BMP files do not initialize this field—making the resultant .BMPs very difficult to handle.

The second possible format for the bitmap information header is a relic of the .BMP format's OS/2 heritage and is described by the following data structure:

```
typedef struct tagBITMAPCOREHEADER
{
    DWORD bcSize;
    short bcWidth;
    short bcHeight;
    WORD bcPlanes;
```

```
WORD bcBitCount;
} BITMAPCOREHEADER;
```

The fields of this bitmap information header hold the same values as a BITMAPINFOHEADER-style header's biSize, biWidth, biHeight, biPlanes, and biBitCount fields, respectively.

You can determine which type of bitmap information header you're dealing with by inspecting the biSize or bcSize field, which fortunately is the same length and appears at the same location in both formats. If this field contains 0x28, then you're dealing with a BITMAPINFOHEADER structure. If the field contains 0x0C, then the structure is of the BITMAPCOREHEADER type. Any other value usually indicates that you're not dealing with a .BMP file.

THE COLOR TABLE The color table specifies the colors used in the bitmap. Microsoft Windows 3.x .BMP files come in four color formats: 2 color (1 bit per pixel), 16 color (4 bits per pixel), 256 color (8 bits per pixel), and 16.7 million color (24 bits per pixel). The number of bits per pixel—and hence the color format—can be determined from the biBitCount or the bcBitCount field of the bitmap information header.

In the 2-color, 16-color, and 256-color .BMP formats, the color table contains one entry for each color. Each entry specifies the intensities of a color's red, green, and blue components and is 3 or 4 bytes long, depending on whether the information header is of the BITMAPINFOHEADER or the BITMAPCOREHEADER style. Color-table entries for BITMAPINFOHEADER-style files use the 4-byte RGBQUAD format:

```
typedef struct tagRGBQUAD
{
```

The .BMP File Format

CONTINUED

```
BYTE rgbBlue;
BYTE rgbGreen;
BYTE rgbRed;
BYTE rgbReserved;
} RGBQUAD;
```

Color-table entries for BITMAPCOREHEADER-type files, meanwhile, use the 3-byte RGBTRIPLE format:

```
typedef struct tagRGBTRIPLE
{
    BYTE rgbtBlue;
    BYTE rgbtGreen;
    BYTE rgbtRed;
} RGBTRIPLE;
```

Regardless of which format it is stored in, each color-table entry can specify a range of red, green, and blue values from 0 to 255. true-color .BMP files do not contain color tables, be-

cause a single color table with 16.7 million entries of 4 bytes each would require 64MB of storage space.

THE BITMAP BITS The final component of a .BMP file is the set of bits defining the image—the bitmap itself. In the 2-color, 16-color, and 256-color formats, each entry in the bitmap is an index to the color table. If a bitmap entry is equal to 7 and the eighth entry (indexes are 0 based) in the color table specifies a color whose red component is 255, whose green component is 0, and whose blue component is 255, then the color of the corresponding pixel is bright magenta (a red-blue mix). In a 16.7 million-color bitmap, where there is no color table, each bitmap entry directly specifies a color. The first of the 3 bytes in each 24-bit entry specifies the pixel color's red component, the second specifies green, and the third specifies blue.

The bitmap bits representing a single scan line are stored in left-to-right order, the same way that the pixels they represent line up on the screen. The

first row of pixel data in the bitmap corresponds to the bottom row of pixels on the screen, the second row corresponds to the row of pixels second from the bottom, and so on. This, too, is a relic of OS/2. All scan lines are padded to 32-bit boundaries. Presumably, this was done to optimize performance on 32-bit processors.

The size of one bitmap entry is, of course, determined by the number of bits per pixel. A 2-color bitmap uses 1 bit per pixel and therefore packs enough information for 8 pixels into every byte. A 16-color bitmap uses 4 bits per pixel, a 256-color bitmap uses 8, and 16.7 million-color bitmap uses 24. As you can see, .BMP files can be very large. For this reason, the .BMP file format includes provisions for compressing 16-color and 256-color files using a form of run-length encoding. The compression format is ill defined, however, so it is difficult to write a program that reads all compressed .BMP files. □

bitmap: It shrinks or expands them to fit the destination bitmap using the `nMultiplierWidth` and `dwIncrementWidth` values computed earlier. The source code for `StretchScanLine` is shown in Figure 6.

Think about what's happening here: If the height multiplier is 0 and the incremental height value is 781,250, the first part of `StretchBits'` for loop never outputs a line. Instead, a line is output every time `dwIncCount` reaches 1 million. On the average, this will occur once every 0.78125 times through the loop, so the destination bitmap will receive 0.78125 times the number of lines contained in the source bitmap.

In the equivalent for loop located in `StretchScanLine`, the multiplier value of 1 will cause 1 pixel to be output every time. An additional pixel will be output every fourth pass through the loop, because the `dwIncCount` value local to `StretchScanLine` will be incremented by 250,000 every time and will reach 1,000,000 every fourth iteration. Therefore, the destination bitmap will receive 1.25 times as many pixels per line as the source bitmap.

This algorithm works equally well no

matter how large or small the width and height ratios are, so it is capable of stretching a bitmap to pretty much any size. Because the vast majority of the computations performed by the functions implementing the algorithm are integer based, performance is not dragged down

*The quality of the images
that AllPaper creates is
inversely proportional to
the difference between the
source and destination
images' sizes.*

by time-consuming floating-point operations. Each call to `StretchBits` requires only two floating-point divisions; the math performed on individual pixel values is entirely integral.

A final element of the stretching code

that bears explanation is the `CopyBits` function, which is listed in Figure 7. If all pixels were 8-bits long and byte aligned, we wouldn't need a `CopyBits` function. But copying the bit or bits representing 1 pixel from the source bitmap to the destination bitmap frequently involves setting certain bits in a byte while leaving others untouched. `CopyBits` lets `StretchScanLine` do this in a high-level fashion.

`CopyBits` accepts huge pointers to the base of the buffers, bit offsets specifying the addresses that the bits will be copied from and to, and an integer (`nBits`) specifying the number of bits per pixel. Depending on whether the bitmap uses 1, 4, 8, or 24 bits per pixel, `CopyBits` invokes one of four special handling routines to copy `nBits` bits from the source buffer to the destination buffer. For 1-bit-per-pixel and 4-bit-per-pixel bitmaps, this involves a lot of bit shifting and ANDing and ORing. For 8-bit-per-pixel and 24-bit-per-pixel bitmaps, the process is much more straightforward because the number of bits translates to an integral number of bytes.

After `StretchBits` returns, `StretchDibAndSave` builds a bitmap file header

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and then writes the bitmap file header, the bitmap information header, and the color table (if applicable) to disk, followed by the bitmap bits from the destination buffer. The resulting .BMP file holds a resized version of the original bitmap.

WRAPPING UP In general, the quality of the images that AllPaper creates is inversely proportional to the difference between the source and destination images'

sizes. In other words, a 640-by-480 image blown up to 800 by 600 looks better than a 320-by-240 image blown up to 800 by 600.

A high-end image-processing program such as Adobe Photoshop or Aldus PhotoStyler can perform the same function as AllPaper—stretching bitmaps to any size—and they'll perform a variety of other transformations as well. But the cost is too much to bear if all you care to

do is stretch a few wallpaper files. When you think of wallpaper, think AllPaper. Your screen will look better, and your pocketbook will thank you for it. □

JEFF PROSISE WRITES OUR TUTOR COLUMN AND IS A CONTRIBUTING EDITOR OF PC MAGAZINE. HE IS ALSO THE AUTHOR OF THE BOOK *WINDOWS DESKTOP UTILITIES*, PUBLISHED BY ZIFF-DAVIS PRESS.

GUIDE TO OUR UTILITIES & HOW TO GET THEM

AllPaper

PURPOSE: The Windows wallpaper feature does not have a facility for adjusting the size of bitmaps. Wallpaper is either centered on the screen or tiled. AllPaper lets you stretch or shrink a bitmapped image so that one copy of the image fills the screen.

SETUP: AllPaper is extremely simple to use. You select a .BMP file, select an output resolution, and then click the Shrink/Expand button to create a new version of the image under the filename of your choice.

Once you have the new .BMP file, you need only copy it to your Windows directory to make it available to the Control Panel's Desktop applet, where wallpaper settings are selected.

REMARKS: AllPaper works with almost any .BMP file, including OS/2-style .BMP files, but there are some exceptions. It doesn't work with the 16-bit and 32-bit .BMP files used by Microsoft Windows NT, and it doesn't work with compressed .BMP files, which can be very difficult to deal with when bypassing GDI (Graphics Device Interface) functions as AllPaper does. If you attempt to input a compressed .BMP file, AllPaper displays the message, "Unsupported file format (DIB is compressed)." DIB stands for *device-independent bitmap*, the data format that lies at the heart of every .BMP file.

On-line services such as CompuServe and ZiffNet are loaded with bitmapped images that can be used as wallpaper. With AllPaper, you can download the image of your choice without worrying about its resolution. If the bitmap is the wrong size, AllPaper can fix it for you. If you download a bitmap that is in compressed .BMP format, however, you will need a different utility to convert it to an uncompressed .BMP file. AllPaper does not support conversion between different graphics file formats.

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■ HARDWARE

Testing Graphics Speed

TIP When you shop for a computer system, salespeople may not let you load programs to test graphics performance. There is a simple test, however, that you can run on almost any Microsoft Windows machine. Start Windows Solitaire, maximize the window, and then use the mouse to grab any face-up card and drag it down to the lower-right corner of the screen. Now drag it slowly (taking up to 10 seconds per pass) back and forth along the bottom of the screen. A fast graphics system will be able to redraw the card so that it appears to move smoothly; slower systems will cause the card to jump and jerk and leave a trailing image as it moves.

*Michael Kingham
Winter Haven, Florida*

► **PC MAGAZINE:** Like the monitor convergence test that uses the Windows Paintbrush (Solutions, February 22, 1994), this gives you another ready tool for evaluating system performance when you go tire-kicking at your local computer store. While Mr. Kingham's test does not single out any particular component of the display system, it does give a good indication of Windows graphics performance. In trying the test on a number of systems, I noticed that the image did not leave a trail on some but instead broke up and didn't completely redraw until I stopped.

Note that before trying the test, you must choose Options from the Game menu and turn off the "Outline dragging" check box if it is checked. Otherwise, you'll be dragging only the outline of the card, which imposes no real burden on the video driver.

Note also that the resolution at which you run the test will affect the results. A screen that looks smooth at 640-by-768 resolution may prove to be jerky at 1,024-by-768 resolution. So be sure to run the test with the proper driver for the resolution and color depth that you intend to use with the system. Since not all salespeople are comfortable with changing Windows graphics drivers, you must be prepared to exercise some tactful persuasion.—*Alfred Poor*

File-Size Mystery

❓ I recently upgraded my hard disk from a 250MB IDE drive to a 1.6GB SCSI-2 drive. When I transferred all my files to the new disk, I was shocked to see that the same files now occupied almost 300MB! Is this a function of how SCSI stores data on the disk? How can the same data take up more space on my new drive than on the original?

*Francisco Rosales
Chiapas, Mexico*

► **PC MAGAZINE:** This is a frequently asked question, since many users have been similarly surprised. The problem is that DOS stores files using clusters, and the larger the partition on your disk, the

larger the clusters will be. Only one file can be stored in a cluster, so a file that contains only one character will still tie up an entire cluster.

Hard disk partitions up to 127MB use 2K clusters. In partitions between 128MB and 256MB, clusters are 4K in size. In partitions between 256MB to 512MB, clusters are 8K, and in partitions between 512MB to 1.024GB, they are 16K. Between 1.024GB and 2.048GB, the clusters are a whopping 32K each. In every case, an "average" file will always waste half of a cluster, and this loss applies to the last cluster of every file throughout the partition.

Minimizing the total storage loss on the disk requires that you back up all the data, repartition the disk so that it has more partitions using smaller clusters, and then restore the files. Three partitions of about 500MB apiece (8K clusters) plus one smaller one may make most efficient use of the available space on your particular disk.

The moral of the story is that you should carefully plan how you will use your hard disk when upgrading your drive. It's far easier to partition the drive the way you want from the start than to repartition it that way later.

—*Alfred Poor*

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■ OPERATING ENVIRONMENTS

Changing Solitaire's Background Color

☛ While trying to change the green background of the Microsoft Windows Solitaire game, I used XTreeGold to view SOL.EXE and found the text, "Do you want to use green background?"

I found the question but not the answer! Can you tell me how to change the background color of the Solitaire game?

Donald L. Anderson
Tomah, Wisconsin

► **PC MAGAZINE:** A quick peek at SOL.EXE, using Borland's Resource Workshop, reveals that the string in question is stored as a string resource with the index 302. More precisely, the string is "Cannot load bitmap.\n\nDo you want to use a green background?", where "\n" represents a new line. However, disassembling SOL.EXE using Sourcer and WinSource, from V Communications, didn't turn up any code that uses this string. Fortunately, the disassembly made it easy to see just how the green background is cre-

ated and how to change the background to another color using DEBUG.

First, you need to choose a color. Open the Control Panel's Color module, and press the Color Palette>> button. Click on the color that's closest to what you want and then press Define Custom Colors. After fine-tuning your choice in the Custom Color Selector dialog, jot down the red, green, and blue values displayed. Close the Color module, making sure to select Cancel, not OK: You don't want to make actual changes to the colors Windows uses.

Now use the Windows Calculator to convert the color numbers to hexadeci-

mal. Start by selecting Scientific from the

Calculator's View menu. For each of the three RGB values, click the Dec (decimal) radio button, enter the number, click the Hex radio button, and note the resulting number. These numbers may contain the letters A through F.

Open a DOS box and use DIR to make sure SOL.EXE has a size of 180,688 bytes and a date/time stamp of 03-10-92 3:10a: This patch won't work on any other version of SOL.EXE! Copy SOL.EXE to SOLNEW.X and enter the command DEBUG SOLNEW.X. At DEBUG's dash prompt, enter the command

```
E CS:EEC B8 rr gg B2 bb
```

replacing rr, gg, and bb with the hex numbers for red, green, and blue. Now enter W to write the changes to disk and Q to quit DEBUG. Rename SOLNEW.X to SOLNEW.EXE and use Program Manager's File | Run menu choice to run it with your new background color. If you're happy with the change, highlight the Solitaire icon in Program Manager, select File | Properties, and change SOL.EXE in the command line to SOLNEW.EXE.

—Neil J. Rubenking

HOW TO CONTACT US

Do you have a hardware, software, or systems problem you can't solve? Do you have a tip you think other readers could use? Perhaps you'd like a better understanding of how something works. If so, we invite you to tell us about it. Our experts can give you practical solutions to your problems, provide techniques for using your software and hardware more productively, and help you grasp computer concepts and understand the latest technology.

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PC MagNet: Select Submissions to PC Magazine from the main PC MagNet menu. Upload your file to the most appropriate library. If at any time you need help, simply type a question mark (?) and hit Enter; a list of commands will be displayed. If you are not already a member of PC MagNet but would like to join, follow the instructions on page 12 to find your local access number.

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Filenames with Spaces

☛ I can't seem to delete the following from my hard disk:

```
C:\IMAGE MD <DIR>  
C:\PW ROTOF.PRO
```

Can you help me get rid of them?

Priscilla M. Aldrich
West Burke, Vermont

► **PC MAGAZINE:** The DOS user manual claims that the space is not a valid character in filenames. But unlike actual invalid characters, such as the plus and equal signs, you *can* create files with spaces in their names. No special programs are required: You can do it with plain DOS commands:

```
REM > FOO
REN FOO FOO?X
```

The first command creates a 0-byte file named FOO, and the second renames that file to FOO_X, where the underscore represents a space.

Here's how to delete or rename such a file. First, type DIR followed by the filename, but replace the space with a question mark—for example, DIR PW?ROTOF.PRO. If any other files show up in the listing, move them temporarily to another directory. Now you can delete or rename the file in just the same way, replacing the space with a question mark. DEL PW?ROTOF.PRO will get rid of it; REN PW?ROTOF.PRO PW_ROTOF.PRO will give it a manageable name.

Your letter suggests that you also have a subdirectory with a space in its name. That's a less common problem, but if you have DOS 6.x, you can easily get rid of the space. Again use the DIR command and replace the space with a question mark—for example, DIR IMAGE?MD. If other files turn up in the listing, move or rename them temporarily. If other directories are listed, use the MOVE command to rename them. When no other files or directories match, use MOVE to rename the directory with a better name—for example, MOVE IMAGE?MD IMAGE_MD.

—Neil J. Rubenking

■ WORD PROCESSING Old Formats for New Printers

❓ Our office recently switched from a LaserJet III to a LaserJet 4P. We'd like to take advantage of the 600 dpi resolution of the newer machine, but when we load a word processing file originally formatted for the LaserJet III and switch the printer

driver to the LaserJet 4P, the layout changes. More precisely, the words get slightly wider, leaving room for fewer characters on each line. This, in turn, affects the positions of the page breaks.

Using the LaserJet III driver to print on the LaserJet 4P eliminates the layout changes, but it limits the resolution to 300 dpi. Is there any way to take advantage of the LaserJet 4P's higher resolution and still keep the same line breaks as when we print on the LaserJet III?

Thomas Mike Moor
Muri, Switzerland

► **PC MAGAZINE:** The problem described here stems from using fonts that are not resolution independent. Windows TrueType fonts, for example, fall into this category. Keep in mind that characters in scalable fonts are generated on the fly. Unless a font is specifically designed to be resolution independent, a change in printer resolution will cause rounding differences in the calculations that will in turn affect the width of each character. That width change will affect the po-

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sitioning of line breaks. So the bad news is that if your documents are all formatted for the LaserJet III using fonts that are not designed to be resolution independent, you can't use 600 dpi on the LaserJet 4P without reformatting your documents.

The good news is that if you're still using a LaserJet III, you can create documents that will print on both the LaserJet III and the 4P. Simply format your documents with a font that's resolution independent, which is another way of saying that the algorithm that generates the characters compensates for differences in printer resolution. With resolution-independent fonts, line breaks will (in theory at least) stay the same when you switch printer drivers and resolutions.

Probably the best known resolution-independent fonts are the Adobe Type 1 fonts associated with Adobe Type Manager (ATM). According to Hewlett-Packard, the built-in scalable fonts in the LaserJet III and LaserJet 4P printers are also resolution independent. Use a font that's available in both printers, and the line breaks and page breaks should stay the same even when you change resolutions.

I have one warning for Ami Pro users. In my tests, I used Microsoft Windows for Workgroups 3.11 and the drivers that come with WfWG 3.11 (the Universal Printer Driver V.3.1.4 HP LaserJet III V.2.1 and the HP LaserJet 4/4M driver 31.V1.20 for Windows 3.1). The CG Times fonts in the LaserJet III and 4P lived up to their claim of resolution independence in all tests with Microsoft Word for Windows, Versions 2.0 and 6.0 and WordPerfect 6.0. With Ami Pro 3.0, however, the line breaks changed when changing resolutions. Hewlett-Packard is aware of the problem but says that it's specific to Ami Pro and something that Lotus will have to fix.—*M. David Stone*

■ SPREADSHEETS

Counting Gribbles

❓ How can I count the number of times a particular name occurs in a Microsoft Excel worksheet or a group of Excel worksheets? If I have a block of data named Photographers, for example, is

there a formula that will tell me how many times the name "Gribble" appears in this range?

*Haider Ali
Al-Safat, Kuwait*

► **PC MAGAZINE:** If you have Microsoft Excel, Version 5.0, you can simply use the new COUNTIF function. The formula

`=COUNTIF(Photographers,"Gribble")`

will give you the number of Gribbles in the range named Photographers. Note, however, that this function is case insensitive.

.....

*The good news is that
if you're still using a
LaserJet III, you can
create documents that will
print on both the LaserJet
III and the 4P.*

.....

If you're working with an earlier version of Excel, you can use the following array formula:

`=SUM(IF(Photographers="Gribble",1))`

When you finish typing this formula, press Ctrl-Shift-Enter, not just Enter. Excel will respond by surrounding the formula with braces, indicating that the formula is an array formula. If you edit the formula, be sure to press Ctrl-Shift-Enter again or the formula won't work.

Like COUNTIF, the array formula ignores capitalization. If you want to count only the Gribbles and omit the gribbles, you need to make use of the EXACT function. This function compares two text strings and returns TRUE if the strings are identical in all respects and FALSE if they're not. To see if cell A1 contains "Gribble", for example, you could write

`=EXACT("Gribble",A1)`

or

`=EXACT(A1,"Gribble")`

To find how many cells in the Photographers range contain the exact text "Gribble", you can write the following array formula:

`=SUM(IF(EXACT("Gribble",
Photographers),1))`

The formula first uses IF to convert the EXACT function's TRUE results into 1s. Then it uses SUM to add up the 1s.

To determine how many cells contain "Gribble" anywhere in their contents, you can employ the FIND function. The formula

`=FIND("Gribble",A1)`

returns a number if any part of cell A1 is "Gribble" (spelled with a capital G). This number indicates the position within A1 at which "Gribble" appears. If "Gribble" appears nowhere in the cell, the formula returns the error constant #VALUE!. To find out how many cells in the range Photographers include "Gribble" anywhere, use IF() in conjunction with ISERR() and then wrap the whole thing in a SUM() function:

`=SUM(IF(ISERR(FIND("Gribble",
Photographers)),0,1))`

The IF(ISERR) portion of this formula turns the FIND function's #VALUE! results into 0s and its numeric results into 1s, and the SUM portion tallies up the 1s. Because the formula operates on a range instead of on a single cell, you must enter it as an array formula by pressing Ctrl-Shift-Enter.

What if you want the number of cells that contain either "Gribble" or "gribble" anywhere in their contents? In this case, you'll need to write two SUM(IF(ISERR(FIND... constructions, one with "Gribble" and one with "gribble". Just put a plus sign between the two and you'll get the grand total.

Unfortunately, neither COUNTIF nor any of these array formulas can operate on multiple worksheets. You might suppose that since Excel 5.0 allows formulas involving SUM, COUNT, and other statistical functions to operate across work-

book pages, it would permit you to use COUNTIF that way as well. But it doesn't. Thus, to count all the occurrences of a particular value in a group of worksheets, you'll need to create separate counting formulas on each sheet and then write a SUM formula to add them up.

—Craig Stinson

■ DATABASES

Auto-Entering Today's Date in Paradox

TIP Working from Harry Goldman's INC.SC script for incrementing and decrementing date fields ("Auto Increment and Decrement in Paradox," February 8, 1994), I've come up with a technique that lets a user auto-enter today's date into a date field by pressing a hotkey. Figure 1 shows my solution, a slightly altered version of Mr. Goldman's original.

You can bind the KTODAY routine to a keystroke, Alt-T, for example. Thereafter the user can press Alt-T to insert the current date into an empty date field.

Gene Millsaps
Mooresville, North Carolina

► **PC MAGAZINE:** To bind Mr. Goldman's KTODAY.SC script to the Alt-T key combination, just put the following line in your INIT.SC file, which Paradox executes whenever it starts up:

```
Setkey -20 Play "Ktoday" ;alt-t
```

```
-----
; KTODAY.SC                               Paradox for DOS
; (with thanks to Harry Goldman, Buffalo Grove, IL)
;
; This script will work only with field type, D - Date
;
; Use the SETKEY command to bind this script to the {Alt-T} key.
; For example, in a script use the following command:
;
; SetKey -20 Play "Ktoday"
;
; This script tests for the following conditions:
; - There must be a display image of the workspace
;   (Table view or form view)
; - The current field must be Date type
; - The current field must be blank
; - The user must be in EDIT or COEDIT or DATAENTRY mode
; - The user can't be in FieldView mode
;
; An Error Procedure is defined to capture errors that could be
; caused 'after the fact'.
;
-----
Proc TodError()
private Err.n
Err.n = ErrorCode()
Switch
Case Err.n = 23 :
Beep
Message "Invalid Field Value: Validity checks prevent date entry?"
```

The Ktoday script checks that Paradox has a display image on the workspace and that it is running in the correct mode. Ktoday also checks that the date being replaced is empty. If you want it to work even when the field already contains a date, delete the Case Not Isblank ([]) line from the script.

You can download KTODAY.SC from PC MagNet: Look in the Sol: Spreadsh/DBMS section of the Utilities/Tips Forum.—Sal Ricciardi

Playing It Safe in Paradox for DOS

TIP Having benefited from many of the INIT scripts (scripts loaded into memory when Paradox is run) published in your column, I thought I should share a set of my own that I could never do without. The scripts are listed in Figure 2.

The reason for the scripts is simple: The Del key is too close to several other useful keys, such as the Backspace, Enter, and Ins keys. People often come to me with tales of missing records during table editing, confessing, "I might have hit the delete key." To prevent this in the future, I remapped the delete function to an easy-to-use location, but one that is harder to hit accidentally: Alt-D. Just make sure the files OOPS.SC and KEYDEL.SC are in your Paradox working directory.

Russell Thackston
Statesboro, Georgia

```
Sleep 3000
Return 1
Case Err.n = 20 :
Beep
Message "No Table Is On The Workspace"
Sleep 3000
Return 1
Endswitch
Endproc

Proc Tod()
private Quit.1, Errorproc
Quit.1 = False
Errorproc = "TodError"
Switch
Case ImageType() <> "Display" : Quit.1 = True
Case FieldType() <> "D" : Quit.1 = True
Case IsFieldView() : Quit.1 = True
Case Not Isblank([]) : Quit.1 = True
Case Search("EDIT",Upper(Sysmode())) < 1
and Upper(Sysmode()) <> "DATAENTRY" : Quit.1 = True
Endswitch
If Quit.1 Then
Beep
Quit
Endif
[] = Today()
EndProc
Today()
```

```
; OOPS.SC
Message "Press Alt-D to delete"
Sleep 1000
Return
```

```
; KEYDEL.SC
Del
Return
```

```
; INIT.SC
Setkey -83 Play "Oops" ;del
Setkey -32 Play "Keydel" ;alt-d
```

Figure 2: Place the OOPS.SC and KEYDEL.SC scripts in your Paradox working directory to remap the Del key to Alt-D. Note the example INIT.SC start-up script.

► **PC MAGAZINE:** When you press the Del key in Edit or CoEdit mode, Paradox for DOS deletes the record. If you do this accidentally and notice it quickly enough, you can get the record back by choosing the Undo menu option. Still, Mr. Thackston's technique is a good alternative for many users because it forces them to delete a record deliberately. You're a lot less likely to hit the Alt-D key combination accidentally than the Del key (I, too, mistakenly hit this key from time to time, especially on my notebook keyboard).

The OOPS.SC script shown in Figure 2 includes a Sleep statement that tells Paradox to pause script play for the specified number of milliseconds. The Sleep command in Figure 2 pauses for approximately 1 second so that the "Press Alt-D to delete" message displayed by the previous line remains visible. You might want to increase that time to keep the message visible longer.

Readers might also want to refer to

Figure 1: The KTODAY.SC listing provides code to let you enter the date into an empty date field in Paradox for DOS.



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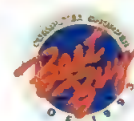
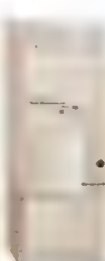
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the April 13, 1993, installment of this column for another technique for trapping the Del key in Paradox for DOS. Paradox for Windows users might want to read the July 1994 column for a technique specific to that product. And don't forget to add the appropriate lines to your INIT.SC file (or create one if you don't have one). Figure 2 provides an example.—*Sal Ricciardi*

■ GRAPHICS

The Dot's the Thing

❓I'm having trouble getting the best printed output from my graphics files. After cleaning up a VHS still video image captured with a Cardinal SNAPplus board at 640-by-480 resolution, the image looked great on my monitor. But the output from my HP DeskJet 550C printer and Fargo Primera Color Printer looked awful—blurred and muddy. It's not entirely the fault of the printers, since they produce glorious color output when I use Photo CD-quality graphics. The capture board allows me to work with higher monitor resolutions, but I don't see how increasing the monitor resolution can help increase my printer resolution.

Milton Lawson
Oxnard, California

►**PC MAGAZINE:** You're right that changing monitor resolution should have no influence on the quality of the printout. That statement is true, however, only when you're using the monitor strictly for display purposes. In your case, you are actually capturing a monitor image to a file and then printing the file. For this purpose, display resolution is a crucially important factor, because a screen or video capture card saves the exact image on the monitor at the current display resolution.

Your confusion is understandable, because typically people use different terminology and different measurement systems to describe the resolution of a monitor, a printer, or a picture. In the discussion that follows, I'll try to use consistent terminology to clear up some of the confusion. For a fuller discussion of the matter, however, you should see "A Halftoning Primer," (Solutions, May 25, 1993).

When you capture a standard 640-by-480 video image to a file, you create a low-resolution image that contains 72 dots per inch. By contrast, your printers are capable of 300 dots per inch (on the HP DeskJet 550C) and 203 dots per inch (on the Fargo Primera). If you were to take the picture file you created and send it to the printer using a dot-for-dot relationship, the same picture that filled the entire monitor screen would be drastically reduced in size, measuring only 2 to 3 inches wide on paper.

Fortunately, you don't need a one-to-one correspondence between picture dots and printer dots to produce high-quality printouts. To find the optimum ratio, start

*When you resample a
picture, you employ
sophisticated algorithms
that actually create new
dots by interpolating from
the surrounding dots.*

with the output device's capabilities and work backwards to determine the optimum resolution for the picture file. The printer's capability, of course, is determined by the number of dots per inch (dpi) it can print. Those dots, however, can be arranged in a number of different ways either to increase the representation of detail or to increase the number of colors and shades of gray. The process of arranging the printer dots is called *halftoning* and requires a little explanation.

Graphics files (such as TIFF) and color monitors are capable of producing 256 intensity levels for each of the three RGB (red, green, and blue) channels. This capability (256 by 256 by 256) yields a broad range of rich colors. Printers, unfortunately, are capable of only two possible intensity levels—on or off—for each of four CYMK (cyan, yellow, magenta, and black) channels.

To simulate varying shades of gray or a wider range of hues, then, printer dots

(measured in dpi) are arranged into a special pattern called a halftone cell, which is measured in *lines per inch*, or lpi. By adjusting the line-screen frequency, you determine the number of printer dots used to compose the cell. For example, the typical halftone cell for your 300 dpi color printer consists of a 5-by-5 dot matrix. This produces 25 shades of cyan, yellow, magenta, and black. If you do the math (300 dpi divided into 5-dot halftone cells) you'll wind up with a line-screen setting of 60 lpi. Because the halftone cells are placed at 45-degree angles to help the dots blend together optically, however, the optimum line-screen setting is 53 lpi.

Theoretically, you should be able to use a picture resolution (which I like to refer to as *ppi* or pixels per inch) that exactly matches the lpi setting of your printer. But to get the best color fidelity when converting from RGB to CYMK, most graphics programs want some redundancy in the picture data and so request that you produce an image with a resolution that is 1.5 to 2 times higher than the lpi setting of your output device. Thus, in your case, I would recommend a line-screen setting of 53 lpi and a picture resolution of 106 dpi.

One final note: You can increase picture resolution in one of two ways. If your video capture card is capable of capturing higher resolutions, simply change your system settings to either 800 by 600 or 1,024 by 768. Alternatively, you can use any image-editing program (Adobe Photoshop, Aldus PhotoStyler, Micrografx Picture Publisher, or the like) to resample the low-resolution image. A word of warning is in order here. There is a huge difference between *resampling* a picture file and *resizing* a picture file; though once again, people often confuse the two terms. When you enlarge a picture (by dragging a selection handle, for example), you merely make each existing dot bigger. This creates a jagged effect and often results in blurry printouts. By contrast, when you resample a picture, you employ sophisticated algorithms that actually create new dots by interpolating from the surrounding dots. Resampling generates smooth color transitions and minimizes the jaggies.—*Luisa Simone*

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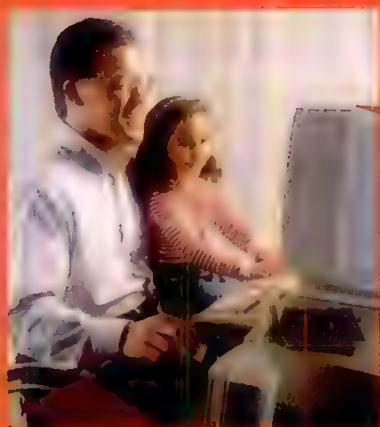
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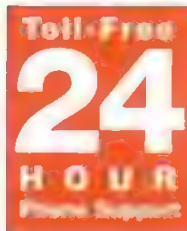
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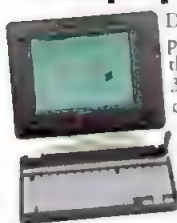
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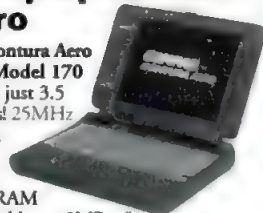
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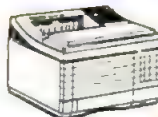
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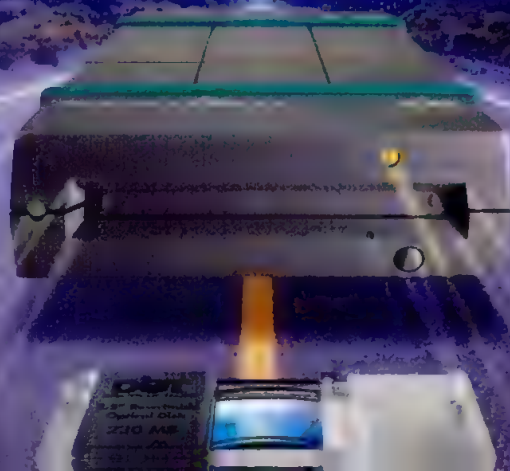
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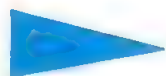
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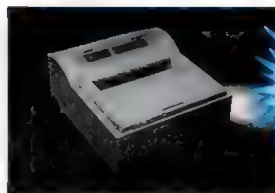
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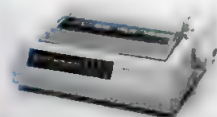
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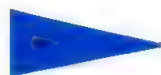
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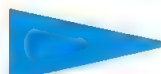
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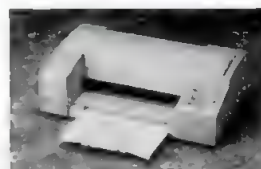
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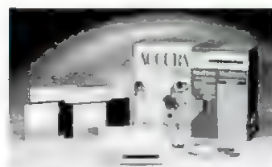
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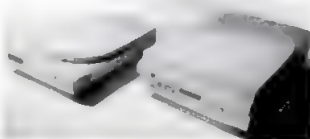


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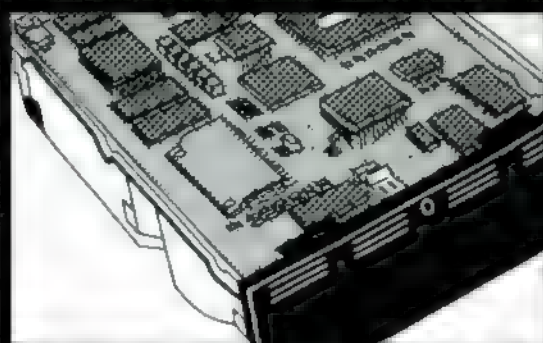
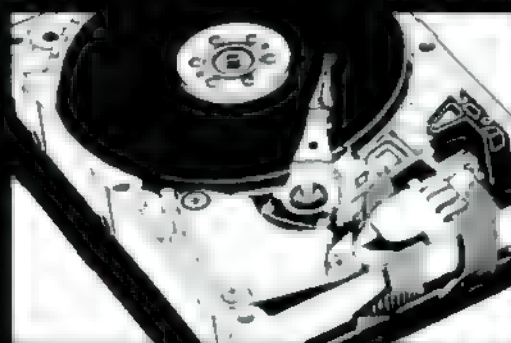
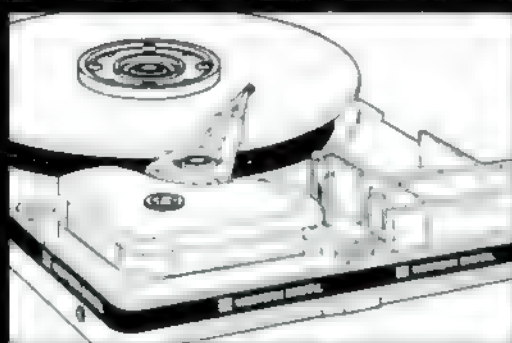
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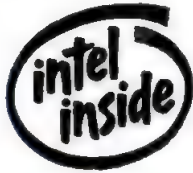
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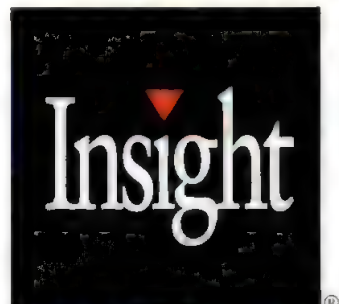
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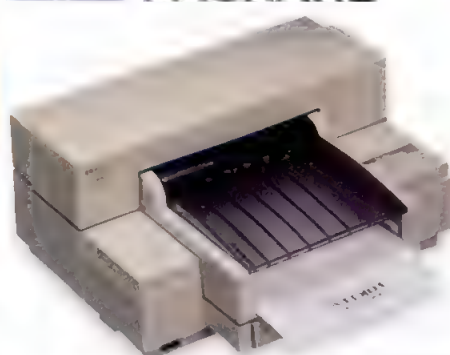
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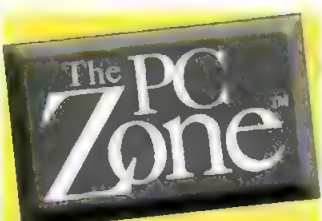
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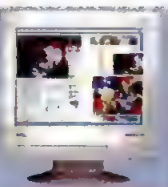
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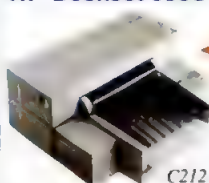
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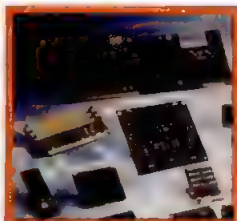
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DX2/40	Active color	250MB	\$3849
DX2/50	Monochrome	209MB	\$3259*
DX2/50	Active color	209MB	\$4199
DX2/50	Active color	340MB	\$4599
DX4/75	Active color	340MB	\$4999

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- ▲ Only 4.2lbs. (mono)

Processor	Screen	Hard drive	Price
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486SX/33	Dual scan	210MB	\$2319
486SX/33	Active color	210MB	\$3219
486DX2/50	Active color	260MB	\$3689

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LaserJet 4MP \$1379.99



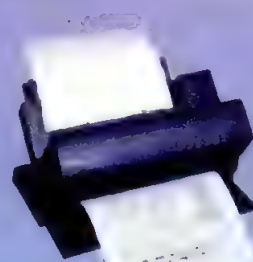
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- ▲ 3-Year warranty

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- ▲ Resolution Enhancement Technology for smooth, crisp text and graphics
- ▲ 3-Year warranty

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- ▲ Integrated AccuPoint pointing device

Processor	Screen	Hard Drive	Price
486SX33	Monochrome	120MB	\$1699*
486SX33	Active Color	120MB	\$2779
486SX33	Active Color	250MB	\$3389
486DX2/50	Active Color	250MB	\$4069

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T4700 and T4800

- ▲ 8MB RAM, expandable to 24MB
- ▲ Brilliant 9.5" display with local bus video
- ▲ 2 PCMCIA slots (Type II, Type III)
- ▲ Microsoft Sound System, built-in microphone, audio out port
- ▲ MS-DOS, UltraFont, Indeo video compression software, Windows for Workgroups 3.11

Model	Processor	Screen	Hard Drive	Price
T4700	486DX2/50	Dual scan color	200MB	\$3129*
T4700	486DX2/50	Dual scan color	320MB	\$3379
T4700	486DX2/50	Active color	200MB	\$4549
T4700	486DX2/50	Active color	320MB	\$4899
T4800	486DX4/75	Active color	500MB	\$5599

Lease for \$114/mo.

T2400

- ▲ 486DX2/50 processor
- ▲ 2 PCMCIA slots (Type II, Type III)
- ▲ Integrated AccuPoint pointing device
- ▲ Optional sound card
- ▲ MS-DOS, Windows for Workgroups

Screen	Hard Drive	Price
Dual Scan Color	250MB	\$2929*
Active Color	250MB	\$3639
Active Color	320MB	\$3799

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T2400



\$2929*

T4700



\$3129*

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- ▲ MS-DOS, Windows 3.1
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- Enhanced power management

Model	Processor	Screen	Hard Drive	Price
T1910	486SX/33	Monochrome	200MB	\$1499
T1910	486SX/33	Dual scan color	200MB	\$2039
T1950	486DX2/40	Dual scan color	200MB	\$2289
T1950	486DX2/40	Active color	200MB	\$2929
T1950	486DX2/40	Active color	320MB	\$3199
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CC3144	14.4/14.4 PCMCIA	\$229.99
XJ196FM	96/96 XJACK	\$179.99
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- ▲ Integrated trackball
- ▲ Two Type II or one Type III PCMCIA slot
- ▲ MS-DOS, Windows for Workgroups
- ▲ 3-year warranty

Processor	Screen	Hard Drive	Price
486SX/33	10.4" monochrome	200MB	\$2449
486DX2/50	10.3" dual scan	200MB	\$3649
486DX2/50	9.5" active matrix	340MB	\$4719
486DX2/50	9.5" active matrix	450MB	\$5069
Intel DX4/75	9.5" active matrix	520MB	\$5339



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4/33s Model 273W	8MB	270MB	\$1369
4/50s Model 173W	4MB	170MB	\$1249
4/50s Model 273W	8MB	270MB	\$1539
4/66d Model 273W	8MB	270MB	\$1889
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4/100t Model 273W	8MB	270MB	\$2299
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- ▲ 32-bit accelerated local bus graphics

Model	Hard Drive	Price
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4/66d Model 173W	170MB	\$1799
4/66d Model 343W	340MB	\$2279

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Bravo NB

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- ▲ PCMCIA Type III slot

Model	Screen	Hard Drive	Price
4/33s 203W	Mono	200MB	\$1629
4/33s 203W	Dual Scan	200MB	\$2249

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- ▲ 486DX2/50 or 486DX4/75 processor
- ▲ 4MB/8MB RAM exp. to 24MB
- ▲ Large dual scan or active color displays
- ▲ PCMCIA type III slot

Model	Screen	Hard Drive	Price
4/50 Model 253W	9.5" Dual Scan	250MB	\$2979
4/50 Model 343W	10.3" Dual Scan	340MB	\$3329
4/50 Model 343W	9.5" Active	340MB	\$4869
4/75 Model 343W	9.5" Dual Scan	340MB	\$3969
4/75 Model 513W	10.4" Active	510MB	\$5799

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Ascentia 900
\$2979

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TravelMate 4000M

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- ▲ 16-bit sound card
- ▲ Integrated Pointing device
- ▲ PCMCIA Type III slot

Processor	Screen	Hard Drive	Price
486SX/25	Enhanced Color	120MB	\$2099
486SX/25	Active Matrix	200MB	\$2349
486DX4/75	Active Matrix	340MB	\$3179

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- ▲ Built-in speakers
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- ▲ 2 3.5" and 2 5.25" drive bays
- ▲ Auto Load/Eject feature

\$79999*

TravelMate 4000E Color

Processor	Screen	Price
486SX/25	Enhanced Color	\$1699
486DX2/40	Enhanced Color	\$2069
486DX2/50	Dual Scan	\$2319
486DX2/50	Active Matrix	\$2819
486DX4/75	8.4" Active Matrix	\$3549
486DX4/75	9.5" Active Matrix	\$4489



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- ▲ 512KB Video RAM exp. to 1MB
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Processor	Hard Drive	Price
486SX/25	120MB	\$929
486DX/33	212MB	\$1249
486DX2/66	212MB	\$1639

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- ▲ 2 Type II or 1 Type III PCMCIA slot
- ▲ TrackPoint II integrated pointing device
- ▲ IBM DOS 6.3, Windows 3.1, Lotus cc:Mail, Organizer, ScreenCam, Official Airline Guide FlightDisk, CoSessions Host, Prodigy, America Online, and FaxWorks 3.0

▲ Port Replicator and Docking Station available

Screen	Hard Drive	Price
Monochrome	170MB	\$1939*
Monochrome	340MB	\$2419
Dual Scan	170MB	\$2519
Dual Scan	340MB	\$2999
Active Color	170MB	\$3389
Active Color	340MB	\$3869

ThinkPad® 510 subnotebook

- ▲ IBM 486BL2/50 processor
- ▲ 4MB RAM exp. to 20MB
- ▲ 200MB hard drive
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- ▲ Type II PCMCIA slot
- ▲ TrackPoint II integrated pointing device
- ▲ 3.5" external floppy drive
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486SL/25	4MB	120MB	\$1229
486SL/25	4MB	250MB	\$1319
486SL/33	4MB	250MB	\$1399

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Contura Aero

- ▲ Type II PCMCIA slot
- ▲ Integrated trackball
- ▲ Weighs only 3.5 lbs. (mono), 4.31 lbs. (color)
- ▲ MS-DOS, Windows 3.1

Processor	Display	Hard Drive	Price
486SX25	Mono	87MB	\$999
486SX25	Mono	170MB	\$1419
486SX33	Passive Color	170MB	\$1989
486SX33	Passive Color	250MB	\$2269

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Concerto \$1229*

Contura 4/25

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- ▲ 4MB RAM expandable to 20MB
- ▲ 209MB hard drive
- ▲ Available with monochrome, dual scan or active matrix color display
- ▲ MS-DOS 6.0, Windows 3.1, trackball

Screen	Price
Monochrome	\$1989
Dual scan color	\$2319
Active matrix color	\$2839

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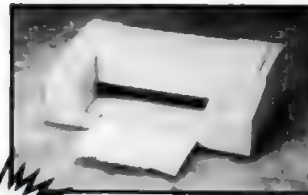
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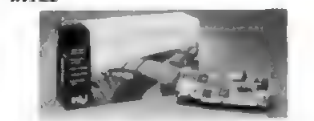
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† Source: PC Computing, April 1994, comparison of the ENV8100 and the HP ScanJet IIcx™

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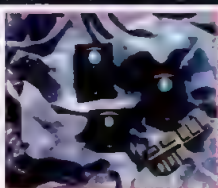
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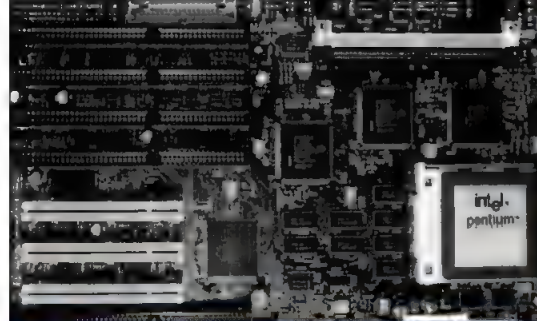
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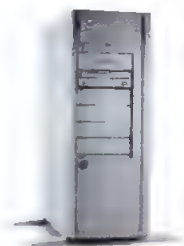
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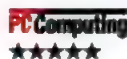
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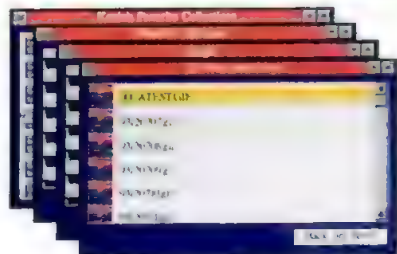
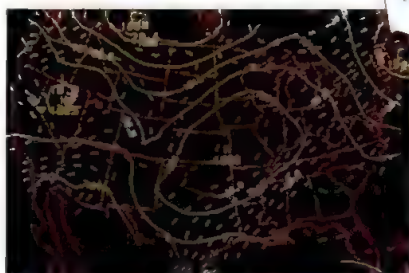
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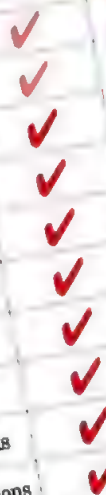
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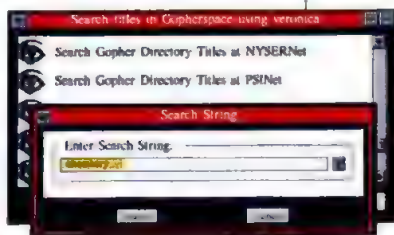
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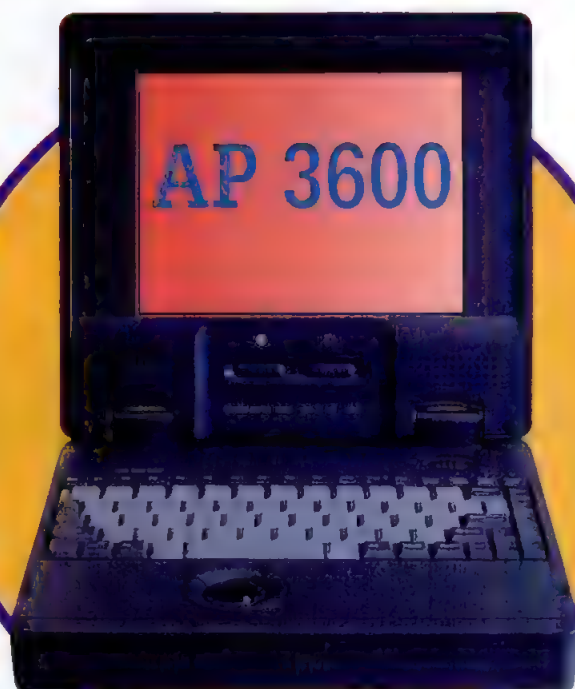
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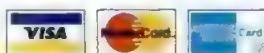
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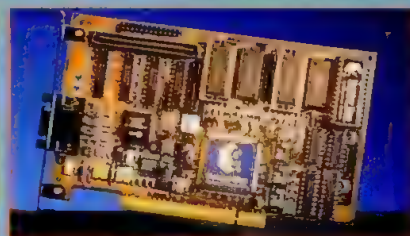


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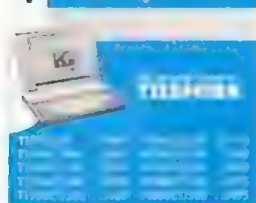
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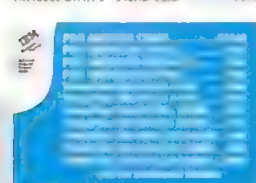
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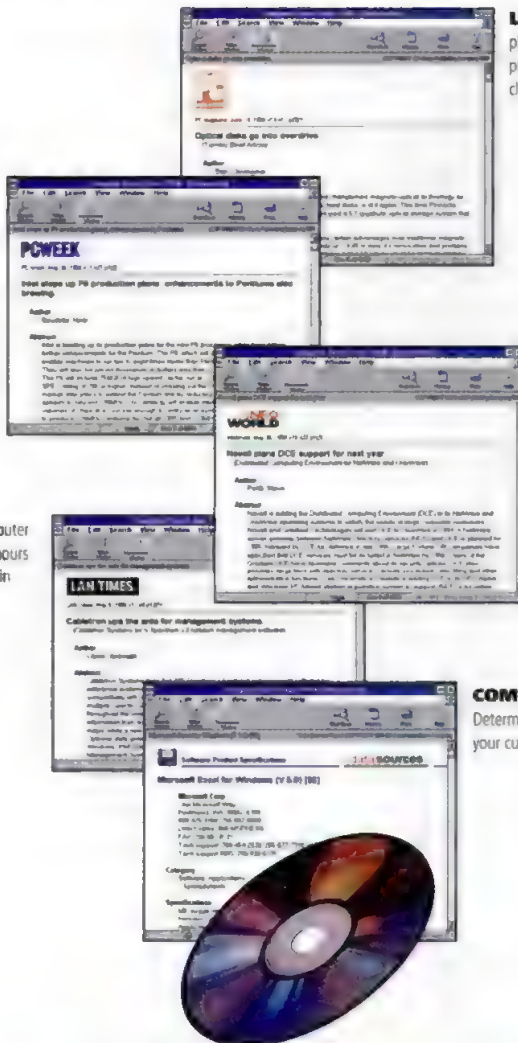
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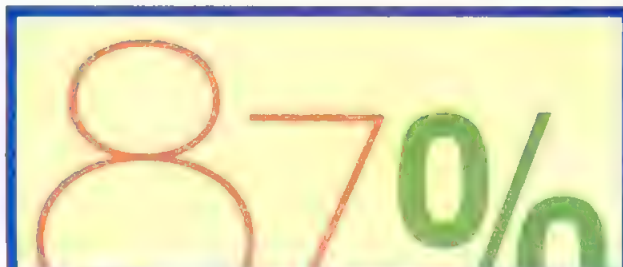
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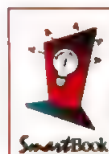
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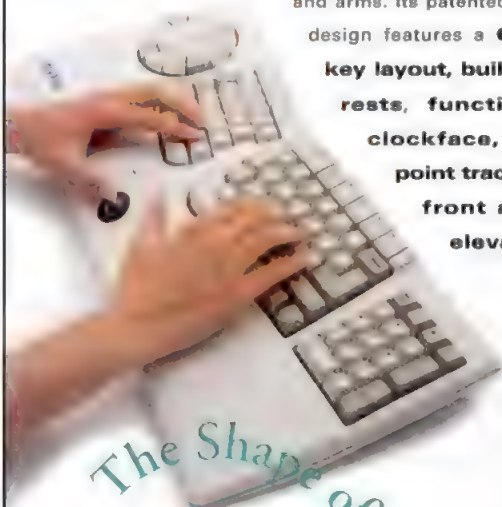
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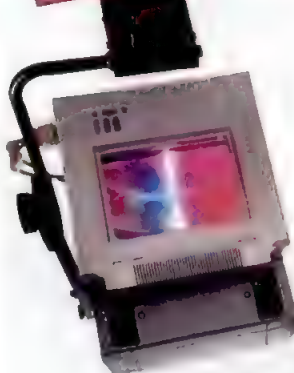
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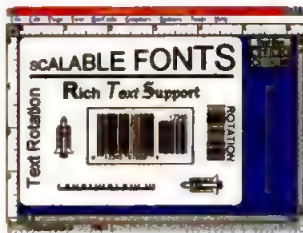
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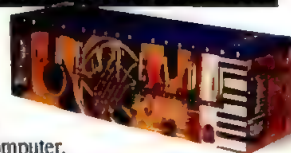
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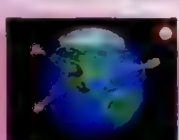
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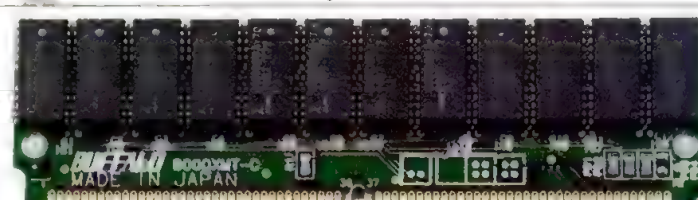
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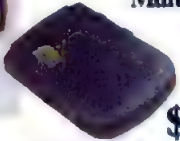


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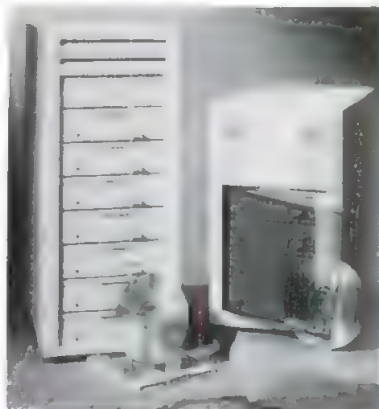
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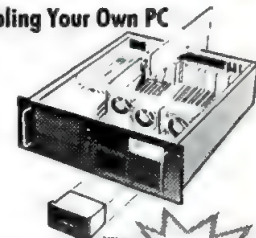
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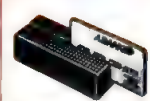
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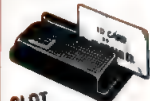
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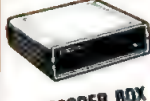
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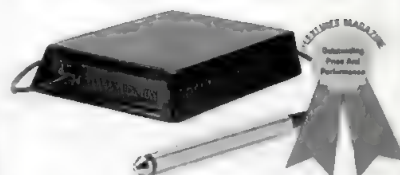
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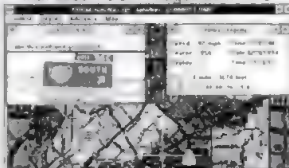
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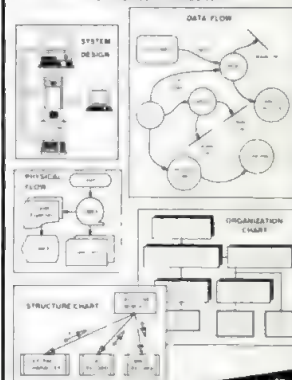
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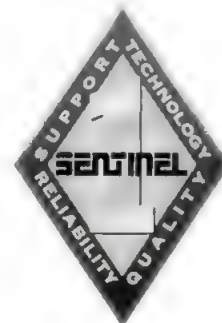
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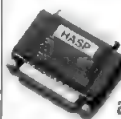
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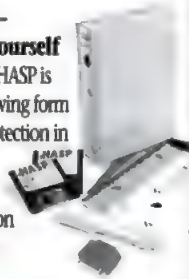
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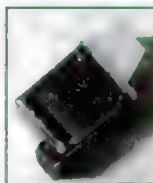
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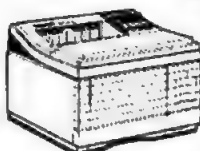
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03. ☐ Manufacturer-Other
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06. ☐ Computer Reseller/VAR/VAD Distributor
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4. Is your company a reseller?
01. ☐ Yes 02. ☐ No

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03. ☐ 26-99 04. ☐ 100 or more

6. Are there any PCs in your office?

01. ☐ Linked to mainframe
02. ☐ Linked to mini
03. ☐ Networked together

7. Please check the equipment currently installed at your location: (Check all that apply.)

01. ☐ IBM or Compatible PCs
02. ☐ IBM or Compatible Mainframes
03. ☐ IBM or Compatible Minis
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05. ☐ CD-ROM
06. ☐ Windows

8. Do you plan to buy any PC products?

01. ☐ Now 02. ☐ In 4 to 6 months 03. ☐ In 7 to 12 months 04. ☐ No definite plans

9. Number of employees in your entire company:
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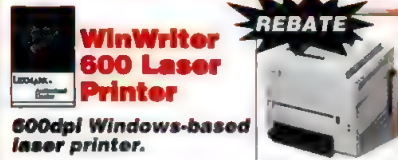
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Coming Up

Fast Desktops

There's a new processor under the hood of today's top-performing desktop PCs. It's still a Pentium, but it runs at 90 MHz internally—50 percent faster than the 60-MHz Pentiums that are quickly becoming mainstream. And because it operates on a meager 3.3 volts, you'll get that computational brute force without turning your PC into a power-hungry furnace. Is this the chip you'll want inside your next machine? Fully equipped Pentium/90 systems are selling for as little as \$3,000 and are worthy of consideration even by price-sensitive buyers. We review 40 new 90-MHz Pentium systems and explain what to look for if you're thinking of buying into the new high end of the PC market.

Presentation Graphics

Tired of the same old boring slide-based presentations? We review nine presentation-software packages that allow you to spice up your slide shows with multimedia pizzazz. Even if you don't normally use your creative side, you may be surprised at just how easy it is to dazzle your audience. We also take a look at different LCD panels that might be displaying your presentations. With support for full-motion video and animation, these screens are the ideal solution for adding a stunning visual impact. There are plenty of options for novices and veteran users of presentation software alike. One of them might prove to be the right package for you.

17-Inch Monitors

Feeling penned in by your current display? If you wish you could fit more windows on your 14- or 15-inch screen, now may be the time to upgrade to a 17-inch monitor. Some units can cost as little as \$600 and can include all the features a business or home user could need. The newest selection of high-end monitors offers superb image quality and control even for relatively demanding chores such as CAD, desktop publishing, and graphics work. PC Labs compares 42 of these 17-inch monitors for brightness, sharpness, display stability, and features so you can decide which one fits your needs.

Free Utility

You've got a graphical user interface, so why should you depend on text descriptions beneath program group icons to differentiate the groups? If you've ever been annoyed by the Windows Program Manager's displaying the same icon for all minimized program groups, you'll love MyGroups—our new utility that lets you change group icons in much the same way you change program icons.

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After Hours

EDITOR'S RATINGS: ★ Poor ★★ Fair ★★★ Good ★★★★ Excellent

CD-ROM

Windows

CD-ROM

Resource-Intensive

Adult Content

Kids (Ages)

Price

Computer Test Prep Meets the New SAT

The rites of outgoing high school seniors include prom night, graduation, driver's licenses, and the SAT, now known as the SAT I. A good mark on this test isn't the sole criterion for college admission, but a bad mark will almost certainly keep a student from attending her college of choice. The stakes and the anxiety are high even for confident students.

Enter three computer-based SAT I prep packages designed to boost scores, enhance skills, and alleviate anxiety. For a generation as familiar with a computer keyboard as with a No. 2 pencil, computer-based study is one way to score big.

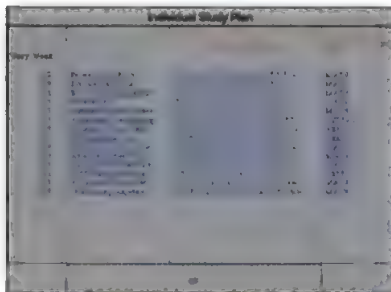
Cliffs StudyWare for the SAT I

Cliffs Notes Inc.; 800-228-4078, 402-423-5050.

Circle 546 on reader service card

★★★★ CD-ROM \$49.95

All students recognize the familiar yellow covers of the Cliffs Notes study guides. Now, they'll want to become familiar with Cliffs StudyWare for the SAT I, an electronic SAT-prep package that combines a software component, called the Computer-



StudyWare for the SAT offers students personal study advice.

ized Tutor, with a comprehensive test-preparation guidebook. The software itself in-

cludes two complete on-line exams modeled after the new SAT and answer sheets for the three additional Cliffs Notes tests included in the guide book.

Students can take the on-line StudyWare Exams in either Test or Tutor mode. Tutor mode, which explains why an answer is correct or incorrect, is especially useful in the early stages of study. The

Test mode, which offers no explanations, simulates the actual test. It's possible to switch modes at any time.

Students select answers for either the StudyWare or Cliffs Notes exams by choosing from the multiple choice buttons on the bottom of the screen, clicking on the appropriate response directly (this option is not available for the paper-based Cliffs Notes exams), or inputting numbers in a grid.

The program features a timer that toggles between elapsed time and time of day. There's also an on-line glossary that defines troublesome terms.

After completing a test, students can either erase it and start over or view their results. The program records test answers, and then graphs

PROBLEM SOLVER

When taking the SAT, answer the easy questions immediately. Mark a plus next to the questions that you can probably answer but that may take time and a minus next to the impossible questions. After answering all the easy questions, go back and work through the pluses and minuses.

and designs reports based on the results of either the StudyWare or Cliffs Notes exams. It can also generate an Individual Study Plan, highlighting areas in which the student performed poorly, and can direct the student to specific pages in the guide book and practice drills in the software that would be beneficial. All of these reports can be print-

ed or viewed on-screen.

Cliffs StudyWare for the SAT I won't guarantee a perfect score. But it will help students make smart use of their study time.

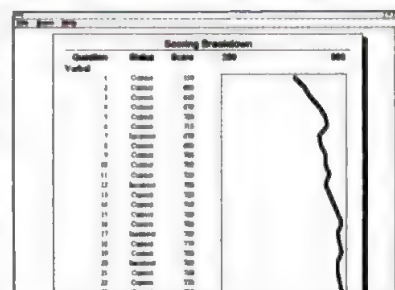
The Princeton Review SAT Computer Diagnostic Exam

The Princeton Review; 800-433-4464, 203-250-2070.

Circle 547 on reader service card

★★★★ CD-ROM \$34.95

The Princeton Review SAT Computer Diagnostic Exam is plain vanilla, start to



The Princeton Review SAT package prints a report after the test.

AFTER HOURS INDEX	
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After Hours

finish. There's nothing in this program to distract students from the task at hand—reviewing and practicing for the SAT.

The program includes two types of tests: linear and adaptive. In the two linear tests, students move through each of the exam's six verbal and math sections as they would in the real SAT. Rather than blacken small ovals, students select their answers with the mouse and then click on the Next or Previous box at the bottom of the screen. Students can mark questions they can't answer and then return to them by highlighting the questions in the Review List and clicking on the Go button. When they're done, they can generate a Quick Report that graphs their results.

The adaptive tests use the student's performance on one question to determine the difficulty of the next; get it right and the next question is tougher than it would be if you answered incorrectly. You answer fewer questions in these tests, so your prorated score is useful only for figuring out roughly how well you would do on a complete test.

The program suffers from a few inaccuracies in its information. More importantly, its review structure is severely limited by the absence of a tutor to explain why an answer is incorrect or how you might solve a difficult problem. This will be remedied in Version 2.0, which should be available by the time you read this. A pop-up tutor will explain incorrect answers; a revamped interface will make navigation easier.

Overall, The Princeton Review SAT faithfully mimics a computerized test session. But the sparse review section limits its usefulness in helping to build a test-taking strategy.

Medio Magazine

Why just read a review of *The Lion King* when you can watch a video clip of it, too? That's the premise behind this compact disk, which combines the excitement of television news with the best of newspapers and magazines, without

the ads.

There's a lot more than just movie clips here. Every issue offers eight sections of information, including Entertainment, Sports, Finance, News, KidStuff, Reference, Scene (fashion and lifestyle information), and Backtalk (reader letters and stories). In short, there's something here for everyone. Much of the written content and photos are from the Associated Press. All of the

material can be accessed via mouse or via text search.

The premiere issue of this monthly, which costs \$59.95 for a 12-month subscription, shows much promise. Expect even better things from future issues.

—Gayle C. Ehrenman

Medio Magazine, Vol. 1, No. 1

Medio

Entertainment, News, Sports, Finance, KidStuff, Reference, Scene, Backtalk

Although Medio Magazine brings you the world on a CD-ROM by delivering more than 10,000 stories, you won't have to worry about getting lost. Like a printed magazine, this is your Table of Contents. You can return to this screen any time—just click the Main button at the bottom of the screen. The Road Map button in the bottom left corner of each screen displays a complete list of the sections in Medio Magazine and allows you to jump directly to them. The Photo Gallery button next to the Road Map gives you a gallery view of the hundreds

Medio Multimedia; 800-788-3866.
Circle 543 on reader service card
★★★★☆ \$59.95

Your Personal Trainer for the SAT

Davidson & Associates Inc.;
800-545-7677, 310-793-0600.

Circle 548 on reader service card

★★★★☆ \$49.95

Your Personal Trainer for the SAT does the best job among our tested products

of capturing the feel of taking an SAT exam. Using test booklets that look exactly like the real thing, students move through a series of preliminary tests to determine where they need the most work. All tests are timed and the program displays a countdown clock.

Having completed a preliminary test, students can get an instant assessment of their skills.

The answers to all questions in the preliminary test are displayed, along with the student's choices. Totals for the number of correct, incorrect, and omitted questions are also displayed, as is the percentage of correct



Personal Trainer can tell you how you rank against other test takers.

and incorrect answers.

Once a student sees where work is needed, he or she can turn to the program's Training Schedule. Options for a quick course or a more thorough review benefit students who only need to brush up, as well as those who need more extensive work.

The Training Schedule works much like the Practice

Drills in Cliffs StudyWare. Specific workout sessions focus on analogies, critical reading, geometry and other subjects. A quiz helps students to test their general knowledge of the SAT to alleviate pretest anxiety.

After taking a practice exam, students are ready to perform post-test analysis, where their scores indicate how far they have progressed. They can then graph their scores to show their percentage of correct responses, as well as how their performance stacks up against their peers. One particularly fascinating (or fearsome) graph shows how the student's score compares with scores from students at more than 325 colleges and universities. A student intent on getting into Wake Forest University, for example, can see his or her score compared against the average scores posted by incoming freshman at that school.

Your Personal Trainer for the SAT strikes a good balance between bells and whistles and solid review. The design makes it easy to use, and the content of the material is first-rate.

—Peter Scisco

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InfoCentral also includes information

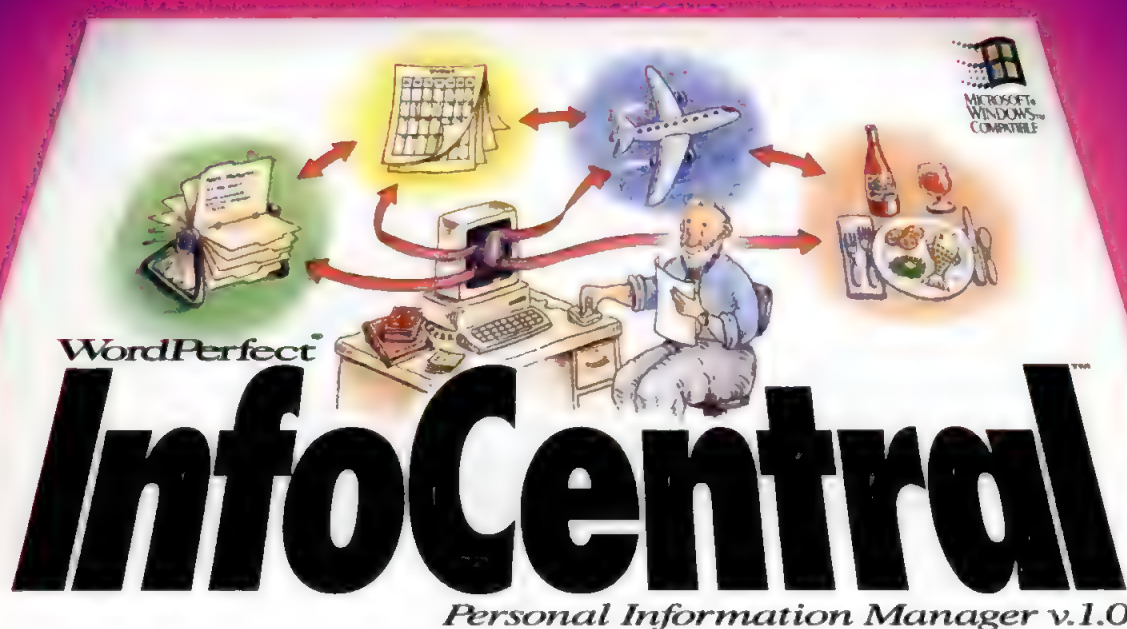
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After Hours

Reading A Dog's Tale

Ruff's Bone

Living Books; 800-521-6263.

Circle 549 on reader service card



Ruff is a very lucky dog. He has a master who throws his bone, albeit recklessly, and lots of places to go and people to see. Your kids will be lucky, too, if they join Ruff on his hilarious adventures.

This latest installment in the Living Books series works the same way as the other titles: Early readers follow along as the story is read aloud in English or Spanish and then



play in the animated pages. But unlike the other programs in the series, Ruff's Bone is an original tale rather than a recast of an existing book. The result is a glorious adventure that is both broad in scope and wildly funny. This may be the best Living Book yet.

The protagonist here is Ruff the dog, who must wander the heavens, earth, and seas to track down his bone, which eludes him at every turn. Along the way, Ruff meets some in-

teresting creatures, including trolls who turn him into a frog and the Bone King who finally returns Ruff's bone to him.

As engaging as the plot may be, it is the animations that truly set this disk apart. Created by MTV animators at Colossal



In Ruff's Bone, kids follow along as a dog tracks down his wandering bone across land, sea, and outer space.

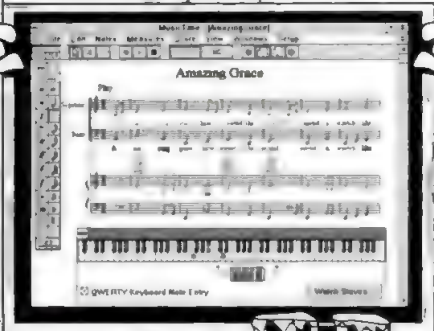
Pictures, the hotspot cartoons show a sophistication and wry sense of humor that will appeal to parents as well as young readers. Don't miss the tap-dancing laundry, the castanet-clawed crab, and the show-

tune-crooning stars. There are plenty more gags that you'll have to find yourself.

And while you're looking, don't forget to help Ruff find his bone...again and again.

—Gayle C. Ehrenman

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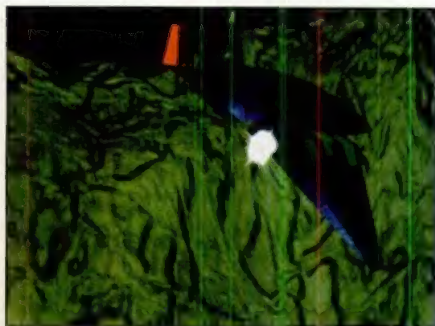
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SubWar 2050's submersible combat fighters look like swimming jets.

Simulations

Subs Ahoy!

SubWar 2050

MicroProse Software, 800-879-7529, 410-771-0440.

Circle 550 on reader service card

★★★ \$59.95

Combine "SeaQuest DSV" and *Star Wars*, then stir in a volatile mix of high-tech weaponry and a setting that's as exotic as it is futuristic. What you end up with is SubWar 2050, an undersea combat simulation set in a near-future world. This isn't the kind of submarine warfare game players are used to: It's more like an air-combat game in slow motion.

Putting aside the questionable plot of private companies waging undersea warfare, SubWar 2050 is an entertaining shoot-'em-up. Its five campaigns offer different landscapes with different scenarios. One campaign is designed for rookie sub captains; the rest are full-bore combat missions.

Sub pilots must rely on their high-speed submersible's sonar to track the enemy, then use thermal layers (places where warm and cool water meet), which can block sonar, to hide from or sneak up on their adversaries. These strategic tactics are enhanced

by the product's use of 3-D terrain, decent sound effects, and an interesting graphical representation of the thermal layers.

SubWar 2050 may appeal to computer combat warriors looking for a new experience, but it doesn't quite have its sea legs. The game doesn't have the panache of such futuristic space combat classics as *Origin's Wing Commander*. Nor does it reflect real-world strategic undersea warfare models such as Electronic Arts' SSN-21 *Seawolf*. A pedestrian story line and a focus on hard-hitting, quick-turning dog fights turn SubWar 2050 into an arcade-flavored fire fest. —Peter Scisco

SPOTLIGHT ON ADVENTURE

Ultima VIII: Pagan marks the merging of two styles of computer gaming: story-based role playing and real-time action and animation. In this continuation of the *Ultima* series, once again you play the Avatar, who struggles against a supernatural being called the Guardian. The Guardian, tired of your interference from *Ultima VII*, whisks you off to another world—Pagan. There, totally friendless, you must not only figure out a way to get home, but also defeat the four Elemental Titans who rule Pagan.

To make *Ultima VIII* more accessible than previous role-playing games,

QUICK CLIPS

Recommended
 It's Your Call
 Not Recommended

➡ Dennis Miller, That's News to Me

A CD-ROM of highbrow humor and low-res video starring the hippest newscaster ever to hit the airwaves. He's been funnier, and I am out of here. Cha-cha! \$24.99. *Sanctuary Woods*, 415-578-6340.

? ESPN Sports Shorts

Just what the world needed: electronic knickknacks for the PC. An amusing if useless CD-ROM of sports-related multimedia clips and toys to spiff up your desktop. \$39.99. *Moon Valley Software*, 805-781-3890.

? The National Health Care Debate CD-ROM

A searchable database of all the legislative documents you need to sort out the mess that is health care reform. Only the scholarly need apply. \$79.95. *I-Mode Publications Inc.*, 800-370-6717.

➡ The Viking Opera Guide on CD-ROM

Bravo! The inclusion of color pictures, music excerpts, and an audio introduction turns a great print reference into an even better tool. The best part is that the package includes both book and disk. \$99.95. *Penguin Books USA*, 800-253-6476.

Ultima VIII: Pagan

Origin Systems has scaled back the size of the game's world but increased the

to 60 or 70 hours to finish.

Be warned, however, that *Ultima VIII* is demonic when it comes to system resources. You'll need a 486-based PC with about 30MB of hard disk space to run the game alone; add in another 9MB of disk space for the Speech Pack.

Despite these drawbacks, *Ultima VIII* raises the bar for role-playing games. Look for the next game in the series, *Ultima IX* (a CD-ROM-only release), to expand on the trend.

—Bernard H. Yee

Origin Systems, 800-245-4525.
Circle 544 on reader service card

★★★★ \$79.95



complexity of its animations. Now the Avatar—graphically larger than ever—can run, jump, leap, fall, and reel in smooth, almost cartoonlike animation. Add in the optional \$24.95 Speech Pack, and you can hear him talk as well. Though the world is considerably smaller than in *Ultima VII*, the game is still quite sizable and can take up

Abort, Retry, Fail?

THE LIGHTER SIDE OF PERSONAL COMPUTING

By Don Willmott



ARF on the road:
St. Lucia, West
Indies.



Oh, Canada!

Toronto's *Financial Post Magazine* recently printed the results of an interesting Andersen Consulting survey.

- Percentage of Canadians who say they approve of the Information Superhighway: 62.7.
- Percentage of Canadians who say they know what the Information Superhighway is: 54.4.



Don't ask us—
your guess is as good
as ours. And while
you're at it, note the
left-handed PC.
(OHIO Monitor
Magazine.)

Back-to-School Necessities

Classnotes 101, from Oxymoron Corp. (214-953-1139), helps students take notes. As the box says, "If you accidentally oversleep and miss class, it's easy to catch up! All you have to do is hand your Classnotes 101 personal disk to a friend who was in class. They select that class, click once, and **boom** their notes are copied onto your disk. . . . You can copy one day or an entire semester with the greatest of ease!"

If your entry is used, we'll send you \$50 and a *PC Magazine* T-shirt. Send your entries to Abort, Retry, Fail?, *PC Magazine*, One Park Ave., New York, NY 10016-5802. Winners this issue: Kevin Bailey, Michelle Billman, Jacques Binette, Wade Evans, Matthew Klejwa, Bill Patterson, and Dan Yahraus.

Help Wanted

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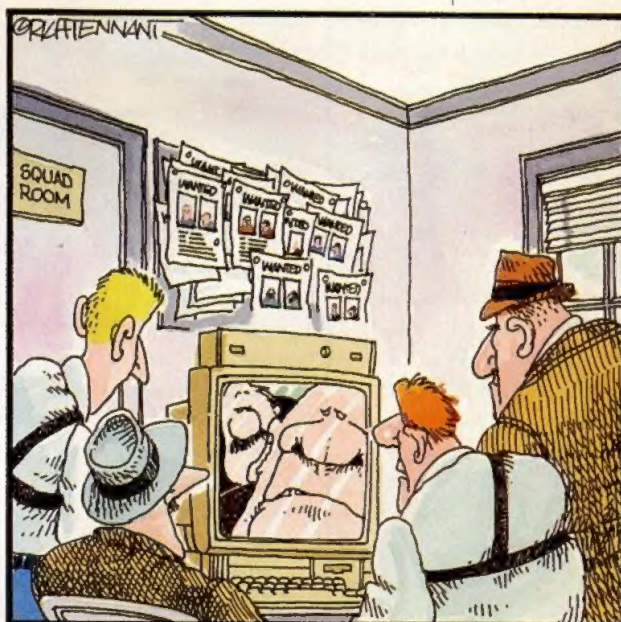
—THE CHICAGO TRIBUNE

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